ARCHIVES OF OPHTHALMOLOGY.

THE PRESENT POSITION OF SCLEROTOMY, WITH ESPECIAL REFERENCE TO THE DANGER FROM LATE INFECTION.

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IT is now nearly ten years since Lagrange introduced his operation of sclerectomy. During the past decade, Freeland, Fergus, Elliot, and Verhoeff, have perfected the operation of trephining; Holth has evolved the punch method, and Herbert has devised a series of operations based upon sclerotomy rather than sclerectomy. All these procedures aim at the production of a fistulous or filtering scar. To-day the literature of the subject would fill volumes, and sclerotomy is being performed by almost every ophthalmic surgeon in the world. I say almost, for some, with singular perspicuity, have obstinately refused to be convinced of the surgical soundness of the fundamental principles of the method. The tide of sclerotomy has reached high-water mark, but even now signs are not wanting that the ebb has commenced. It may even be that iridectomy, which has been widely condemned, I think, upon wholly insufficient evidence, may once more become the usual operation for all kinds of glaucoma.

It is I think clear that most of the methods used to obtain

a filtering scar are equally efficient. One surgeon finds Lagrange's operation best suited to his technique, others, the majority, prefer trephining, while a few including myself choose the Holth procedure. A few again remain faithful to Herbert's wedge isolation method. All these plans yield the desired scar in the majority of the operations; all fail not infrequently, and finally all the methods are liable to that final tragedy which is inherent in a filtering scar—late infection.

At the present time it ought to be possible to arrive at a tentative estimation of the real position which sclerotomy should occupy in the treatment of glaucoma. Is it the operation of election in almost all cases of glaucoma as Elliot would have us believe? Is iridectomy to be selected in acute cases, and sclerotomy reserved for the majority of the chronic cases? Or are the dangers of sclerotomy so real that it must only be performed when iridectomy has failed or is otherwise unsuitable?

Before trying to answer these vital questions I would point out that the majority of operators prefer to combine iridectomy and sclerotomy; we are not therefore comparing iridectomy with sclerotomy, but balancing the results of pure iridectomy against sclerotomy cum iridectomy; in other words we have to choose between a simple procedure and a more complicated one.

Again, we have successful cases of iridectomy with a duration of anything up to twenty years, and can only compare them with sclerotomies dating back little more than six or seven years. It is obvious that any judgment we make can in its essential nature be only of a provisional nature.

Before passing even a tentative verdict we must answer a further question. Have the results of sclerotomy shown any marked superiority to those of iridectomy? This question has most certainly so far not been finally settled. The answer can be based only upon extensive statistics, and it is essential that the majority of the cases shall have been followed up for five years or more. The actual presence of chronic glaucoma should be verified by the condition of the disks, the nature of the fields of vision, the size of the blind spot, and the tension as measured by the Schiötz tonometer. It seems necessary to insist upon a careful examination, because I feel certain

that operations have been performed in cases where the actual evidence of glaucoma was far from convincing. I have myself seen cases of women at the menopause when there were pain and slight hypertension relieved by miotics. The disks were "suspicious," if not actually pathologically excavated. Careful examination of the fields and blind spots failed to confirm the diagnosis of incipient glaucoma, and they have all so far lost their symptoms. Such cases can be submitted to operation, and help to swell the list of good results. The necessary statistics cannot be collected from the work of a single operator. Glaucoma is happily not so common as to furnish any one surgeon with a sufficient number of cases unless indeed he is fortunate enough to be the director of a large continental clinic. We must, I fear, rule out Indian experience, because after four years of work at the British Ophthalmic Hospital in Jerusalem I am aware that only a small proportion of the visitors to this type of clinic ever reappear, and it is precisely the failures which are lost sight of. Nor is it often possible in the case of an ignorant native to map out the fields of vision and the blind spot. We must rely upon work among civilized races.

As far as I am aware the statistics I suggest have not been collected and published and we are not yet in a position to state that sclerotomy should take the place of iridectomy because the results are markedly superior.

In 1913–14, Mr. Jameson Evans and myself made an analysis of all our operations for all kinds of glaucoma extending over a period of five years. They were collected from our private operations, and from the work done at the Birmingham Eye Hospital, the Coventry General Hospital, and the Leamington General Hospital. We found that we had performed 161 operations, a number far too small to yield reliable statistics. Our analysis was presented to the Oxford Ophthalmological Congress in July, 1914, and was published in the *Ophthalmoscope* for August, 1915. We were both much surprised to find that we each independently had obtained results from simple iridectomy which were as good as those which had followed the various operations of sclerotomy. For the convenience of those who have not access to the paper, I append a summary of our analysis. I freely admit that the

numbers are far too small to be of value, but they do at least suggest that iridectomy is not so ineffectual as some ophthalmologists would have us believe.

STATISTICS OF OPERATIONS FOR GLAUCOMA

ACUTE AND SUBACUTE CASES

Operation.	Number of Cases.	Vision Improved or Preserved.	Tension Reduced to Normal.
Sclerotomies	42	32=76%	35=82%
Iridectomies	28	20=71%	23=88%
Total	70	52=74%	58=83%

CHRONIC CASES

Iridectomies	30	25=83%	21=70%
Trephine	23	17=74%	20=87%
Herbert's Wedge	15	11=73%	12=80%
Holth's Punch	18	13=72%	14=77%
Herbert's Small Flap	5	2=40%	2=40%
Total	91	68=75%	69=75%

ALL CASES

Total	161	120=74%	127=78%

These figures bring out four points. There is little to choose between the various operations performed. The percentage of good results is higher than might be imagined even if we consider the average duration of these cases to be only two years. It amounts to about 75% of all cases. The visual results are as good in chronic as they are in acute glaucoma. And, finally, the table shows the comparative rarity of operations for glaucoma.

Mr. Evans has been responsible during the period under consideration for about 50,000 patients at the Birmingham Eye Hospital. I have gathered my operations largely from the clinics at Coventry and Leamington and during the past five years must have seen about 18,000. This gives a total of

68,000 new patients, and with all our private patients added in they yielded only 160 operations for glaucoma. Even if we exclude the trivial accidents and foreign bodies which swell the total, the figure is only about 1%. This shows how impossible it is for any single individual to form conclusions of any real value as to the comparative efficiency of the various operations he has performed for glaucoma.

I can discuss the question only by relying upon my personal experience drawn from some seventy operations, and from what I know of the results obtained by my colleagues at the Birmingham Eye Hospital. My senior colleague, Mr. Wood White, tells me most emphatically that although he has tried sclerotomy he is still well satisfied with the results of iridectomy which he regards as the operation of election in most cases of acute and chronic glaucoma. At the time the above table was prepared and up to the end of 1914 my choice of operation would have been as follows: iridectomy for acute glaucoma and for mild cases of chronic glaucoma which were very gradually losing ground under miotic treatment; sclerotomy for subacute cases and for well-developed or long-standing examples of the chronic disease. During the past six months, however, the occurrence of eight cases of late infection which led to the total loss of four eyes has forced me to alter entirely my opinion and to conclude that sclerotomy is so dangerous that it must be reserved for selected cases only. I am reluctantly obliged to abandon an operation which has apparently cured many of my cases, because the subsequent history of so many of them has been thoroughly bad. I propose, therefore, to critically examine the two operations and to try to answer the three questions I propounded at the beginning of this paper.

What are the objections to iridectomy?

It has been said that it is ineffective, that it is technically dangerous, that in cases with a small field it may cause total loss of central vision, and that it may be followed by expulsive hemorrhage.

Iridectomy is ineffective. I have not found the operation ineffective. Both Mr. Evans and myself find that it has been successful in 75% of our cases, and that its results compare favorably with those of sclerotomy. This applies to all forms

of glaucoma. I have several patients who have been operated upon by iridectomy by older surgeons from ten to twenty years ago in whom the disease has been permanently arrested.

The operation is technically dangerous. I have so far only lost one eye after iridectomy. The iris prolapsed, and iridocyclitis necessitated enucleation. I have had far more trouble with sclerotomy. It is true that in cases with a very shallow anterior chamber, which have been rare in my practice, the operation demands great care and a high degree of skill, but generally it is far easier than any form of sclerotomy. The lens has been wounded during iridectomy, but so far I have escaped this complication. I have, however, made a section of an eye I had trephined, and the lens capsule was ruptured and lens substance blocked the trephine hole. I had not the slightest idea that the trephine had been anywhere near the lens.

Vision may fall rapidly after iridectomy. This is unfortunately true. I have recently had two examples in which a small iridectomy was made for chronic glaucoma. In each case the patient was ready to leave the hospital within a week and never had the slightest injection of the eye. Yet the vision was much worse after the operation although the tension had been reduced to normal. I have had the same experience after an uncomplicated sclerotomy with small basal iridectomy. The catastrophe seems to be the result of decompression rather than a peculiarity confined to iridectomy.

Expulsive hemorrhage. This is a tragedy to be feared during the old classical iridectomy with a large incision. It is my practice to make a very small iridectomy, and I have successfully treated a case of hemorrhagic glaucoma secondary to thrombosis of the central vein by a small iridectomy.

As far as I can see the only valid objection to iridectomy is that it may fail to reduce tension in cases of chronic glaucoma. In such cases it is easy subsequently to trephine the eye.

My practice is to make an incision with a small keratome or bent broad needle entering behind the limbus. I then withdraw the iris with Matthieu's forceps (Liebreich's), and cut it off with one snip of the scissors. This small incision avoids most of the dangers of the old broad iridectomy, and the result is as good in my practice as that following the larger excision

of the iris. If iridectomy acts, as Fuchs and Thomson Henderson teach, because the cut iris never heals, a small iridectomy should be as effective as a large one.

What are the objections to sclerotomy?

They can be divided into two groups: immediate and remote. We shall see that the remote complication is a formidable one, and practically is so important that it is not necessary to devote much attention to the minor disadvantages.

Immediate objections:

Technique. Nearly all the operations include iridectomy and, therefore, as the whole is greater than its part, and sclerotomies are more difficult than simple iridectomy, they are more complicated, and constitute a greater trauma. But even simple sclerotomy however performed demands a very special technique, and any departure from the best method is liable to yield unsatisfactory results. Elliot lays great stress upon the facility of trephining. Anyone can make a hole in an eye, but the correct trephining operation is in my opinion very difficult, demanding much thought, care, and skill. The same applies to the punch operation, to Lagrange's method, and to the wedge isolation. In the hands of the ordinary ophthalmic surgeon I feel sure that simple iridectomy is far easier than any form of sclerotomy.

The unreliability of the results. It is very difficult to obtain a satisfactory filtering scar. In some cases the wound, whether made with trephine, punch, or scissors, heals up solidly and no filtration occurs. These operations, if associated with iridectomy, may nevertheless be quite efficient. In other cases a large ectatic bleb forms which is ugly and may be uncomfortable. Even these scars though obviously fistulous may fail to reduce the tension. This fact has been noted by both Mr. Evans and myself. Again any form of filtering scar may cause prolonged low tension.

Late re-formation of the anterior chamber. This is an anxious complication. In one of my patients I made a small buttonhole in a very thin flap. The anterior chamber took fourteen days to re-form. My patient had only one eye and I heartily wished I had performed iridectomy. Ultimately the chamber refilled, but a myopia of 1.5 D. was added to the original refraction. I have noted this development of myopia in other cases.

Iritis. Sclerotomies are far more liable to slight iritis than simple iridectomy, a fact emphasized by Elliot.

There are many other complications which can be avoided only by a carefully worked out technique, but they can to a large extent be escaped and so do not constitute a real objection in the hands of a skillful surgeon. But I see no means of guaranteeing the correct scar. I have performed upon the same day two exactly similar punch operations. One has healed up solidly, the other has yielded an ectatic scar.

Remote complication. Late infection is the final tragedy of sclerotomy.

It is a matter of common knowledge that the cystoid scar which occasionally follows cataract extraction is highly dangerous. Many eyes have been lost years after the extraction, and all ophthalmologists do all they can to prevent any entanglement of iris or capsule in the wound, because they quite justly fear late infection. And yet, such are the changes in fashion, for the past five years we have all been trying to produce filtering scars which in many cases are cystoid cicatrices. Some of us have already paid the full penalty.

At first we heard little of the matter. Elliot devotes only a few sentences to it in his book. But during the past three years cases have been reported in increasing frequence. The paper which Mr. Evans and I read at Oxford last July was followed by a discussion which practically was a discussion on late infection. One member of the Congress after another rose up and cited cases of late infection which included panophthalmitis and even sympathetic ophthalmitis. It was obvious that they were seriously anxious about the matter. I had then had only one example following a wasp sting, and I had not realized the import of the complication. However, this year I have had seven more cases, a veritable epidemic of late infection. The matter is of such vital import that I offer no apologies for giving the abridged case histories. It will be seen that late infection has followed every class of scar, the apparently solidly healed, the satisfactory scar, and the ectatic. All the ectatic cases ended favorably, so there seems no reason to fear this type of scar more than the others.

It is convenient to divide the cases into *acute infections* which destroyed the eye, and *mild infections* which recovered. It will

be seen that I have experienced four of each. Owing to the great pressure of hospital work caused by the war it has been impossible to work out the bacteriology, but the exact nature of the infective agent is of little moment.

ACUTE INFECTIONS.

H. D. Male, aged 36 years. This was a case of heterochromic cyclitis in which the typical cataract and glaucoma developed. The cataract was extracted after preliminary iridectomy, and a vision of $\frac{6}{9}$ and J. i. was obtained. The man returned to his employment, boring naval guns, and worked for a year. The typical glaucoma now rapidly developed. The tension rose and the disk became cupped, with a contracting field.

On January 24, 1910, the eye was trephined below. The disk entered the anterior chamber and was extracted with Matthieu's forceps with much difficulty. The eye was injected for nearly a month, but quieted down completely. Basal iridectomy was combined with trephining so the patient had two colobomata: one up, one down. The aperture healed up solidly and there was never any obvious filtration. The tension remained normal, but the disk gradually became more and more excavated, and sight was slowly reduced.

In February, 1915, five years after the operation, the patient reappeared with an intensely injected painful eye. The anterior chamber was full of pus, and there was a large intercalary staphyloma. I had not seen the man for a year, but I gathered that the eye had become suddenly inflamed some weeks previously. The eye was enucleated, and a second large staphyloma was found in the posterior segment.

It is possible that this was not a true example of late infection, but was the natural end of the heterochromic cyclitis. The eye had never been injected during the five years I had him under observation, although the keratitis punctata which is a characteristic feature of the disease was always present, even when the vision was $\frac{6}{6}$. I am disposed to regard the inflammation as due to an infection from outside, and include it with the others.

E. H. An alcoholic female, aged 55 years. A case of chronic glaucoma. T = 82*mm* and 72*mm* of Hg. by Schiötz tonometer. Deep cups. VR = $\frac{6}{18}$, VL = hand reflex only.

Feb. 16, 1914. Punch operation with complete iridectomy upon the right eye. A satisfactory filtering scar developed with no ectatic bleb. The vision rose to $\frac{6}{6}$. The tension was permanently reduced to normal.

April, 1915. Condition of eye satisfactory. T normal; V = $\frac{6}{18}$. The operation was regarded as a complete success.

May 3, 1915. Fifteen months after the operation the patient appeared with the eye in a state of acute panophthalmitis and I was compelled to eviscerate it. She stated that fourteen days before she had "ulcers" on the left lower lid. These got better. Then the right lower lid became "ulcerated" and three days ago the eye became inflamed and painful.

Here we have a clear history of acute conjunctivitis followed by panophthalmitis. A useful eye was destroyed, although the scar was a satisfactory one with no prominent bleb.

We shall see later that the left eye which had also been punched became infected but recovered.

W. J. Male, aged 64. Suffered from chronic glaucoma with T + 1. VL = hand reflex.

Feb. 20, 1914. A Holth's punch operation was performed upon the left eye and a basal iridectomy was added. A very small tear was detected in the flap. It was sewn up and healed perfectly.

The second eye was also punched and is still in a satisfactory condition with good vision and normal tension.

March 15, 1914. The tension of the left eye is normal. The punch hole contains a tag of iris; there is good filtration but no bleb. No sign of any opening or thin spot in the conjunctiva. V = fingers at one foot, an increase from hand reflex.

April 10, 1915. A year and two months after the operation the patient appeared with a late infection. There was a yellowish opaque swelling over the aperture with intense injection and hypopyon. T + 1, V = P.L. Under treatment the iridocyclitis quieted down, and the hypopyon absorbed. The swollen area over the scar flattened down. The eye, however, became very soft, and remained injected. Vision was entirely lost, so the eye was removed.

Here again we have a clear case of late infection. Fortunately the eye was of no value. The buttonhole at the operation may have been a factor in the result, although the scar seemed to be a very satisfactory one.

E. L. Aged 57, an alcoholic female. She was suffering from subacute glaucoma of several months' duration, which had been absolutely neglected. VR = $\frac{6}{18}$. T + 1. Field contracted to 30°. Deep glaucomatous cup in each disk.

April 16, 1913. Punch operation with basal iridectomy under ether anæsthesia. The sclerotomy reduced the

tension to normal, but in spite of this all sight was rapidly lost. The operation, although it cured the inflammatory state and reduced the tension to slightly subnormal, seemed to hasten the loss of sight.

August 6, 1913. The patient was stung on the upper lid by a wasp which caused much swelling of the lid and redness of the eye.

Sept. 17, 1913. Patient appeared and the eye was found to be acutely injected. There was a yellowish white area over the punch hole and an acute iritis. The iritis quieted down under atropine, but the hole closed up completely with cicatricial tissue. The tension rises occasionally, but there has been no more pain. The left eye still has V = $\frac{6}{9}$. Tn, but there is a deep glaucoma cup.

SLIGHT CASES

E. S. Aged 70, female. Affected with paralysis agitans. Suffered from slowly progressive chronic glaucoma in each eye. T R and L = + 1.

February 4, 1914. Holth's punch operation with a basal iridectomy was performed upon the right eye. A similar operation had been carried out upon the left eye on January 21st. Large ectatic scars developed on both sides, but tension was permanently reduced, and sight maintained at $\frac{6}{6}$ in each eye.

November 13, 1914. Eight months after the operation, the patient appeared with a severely inflamed right eye. The bleb was now yellow in color, and there was great œdema of the surrounding conjunctiva. Pain was severe and the iris was muddy. Posterior synechiæ had already developed. This patient had been shown to the Midland Ophthalmological Society as an example of undesirable ectatic scars. I was now able to show her to the same society as a case of late infection. Fortunately the eye treated with atropine and muff warmers made a complete recovery.

C. G. Aged 60. A case of chronic glaucoma. When this lady came under my charge nearly two years ago her right eye had been removed by Mr. Pooley of Sheffield for intra-ocular tumor. Her vision was then $\frac{6}{9}$, but the aspect of the left disk was very suspicious. The case was watched closely and it soon became obvious that chronic glaucoma was present. In spite of miotics the field contracted and vision fell to $\frac{6}{24}$. The tension rose to 50*mm* of Hg. and I was compelled to operate.

January 29, 1914. Punch operation with complete

iridectomy. A large ectatic scar developed gradually, but in spite of this the tension occasionally rose to 35*mm* Hg.! The acuity was for a time improved to $\frac{6}{9}$, but the lens is gradually becoming cataractous with increasing myopia.

June 1, 1915. I saw the patient and found that she was holding her own well. I, however, remarked to my Belgian House Surgeon, Dr. Thienpont, late of St. Nicholas, that I regarded her bleb as a dangerous one liable to late infection.

My words were prophetic, for three days later, on *June 4, 1915*, five months after the operation, the patient appeared with an infected eye. The bleb was covered by a raised, flat, milky-white matt area of conjunctiva. The eye was painful, and there was considerable ciliary injection, but no further evidence of iritis. A culture on blood serum was made, and we obtained a luxuriant growth of a greenish gray mold, which the Botanical Department of Birmingham University pronounced to be *Mucor septatus*. A rapid cure was attained by the use of protargol drops, and now all immediate danger is at an end. As a matter of fact I believe that the infection did good, for the bleb has flattened down and is I hope now less liable to infection.

E. H. The case of panophthalmitis described above came up on *June 21, 1915*, with acute iritis in her remaining eye. This eye was punched on *February 9, 1914*, sixteen months before the infection. She was restless at the operation and a drop of vitreous appeared in the wound. In consequence no iridectomy was performed, and the flap was not sutured. The eye was dressed forty-eight hours later: it was looking perfectly healthy, but the flap had rolled back leaving the punch hole freely exposed. An anæsthetic was administered and the flap sutured in place. The eye did very well. The tension of 72*mm* of Hg. was reduced to normal, and vision is still well maintained at $\frac{6}{18}$. A sound filtering cicatrix developed, which showed no tendency to bulge. This case has completely recovered and her present state is satisfactory. This eye had resisted the infection which destroyed its fellow.

E. F. Aged 52, first consulted me on *December 18, 1913*. I found that she had, unknown to herself, completely lost the sight of her right eye from chronic glaucoma. As the eye had occasionally shown some tendency to become inflamed and painful I performed a punch operation with a very small basal iridectomy. At the present moment there is barely a trace of the punch hole to be seen: it has healed up solidly and smoothly. The small basal iridectomy seems

to have done all that was necessary, for the eye has remained quiet since the operation.

The left eye had a highly suspicious disk. I treated it with miotics for six months, at the end of which period it was obvious that a steady deterioration of the sight had set in, and simultaneously the field began to contract. Finally the Schiötz showed a hypertension of 50*mm* of Hg. It was necessary to operate. It would have been an ideal case for a narrow iridectomy, for the eye was almost normal. V = $\frac{6}{12}$. In an evil moment I decided to punch the eye, which I did on *July 21, 1914*, adding a basal iridectomy. Unfortunately the flap was very thin and a very small triangular tear was detected over the punch hole. Probably in my anxiety to get well forward the punch slightly engaged the reflection of the flap. In consequence the anterior chamber did not show the slightest sign of re-forming for a fortnight. It ultimately reappeared, but for some weeks there was a considerable increase of the myopia. This gradually disappeared, and the final result was excellent. There was only a small raised scar with a central bleb the size of a pin's head. Vision returned to $\frac{6}{9}$, and the tension remained normal. My patient progressed in a completely satisfactory manner till early in June, 1915. While I was away for a few days the eye suddenly became painful, but she took no notice of it for two days although I had warned her to come to me at once if anything abnormal occurred. Ultimately on *June 4, 1915*, about eleven months after the operation, she consulted Mr. Jameson Evans at Birmingham. He found ciliary injection, discoloration of the iris, and posterior synechiæ. The bleb looked healthy and there was no discharge. Atropine and protargol drops were ordered. On *June 8th* there was a thick mucopurulent discharge, which contained no organisms visible in a smear. *June 9th*, still profuse discharge. Pupil dilated. *June 17th*. I saw the patient. There was no discharge, but there was some fine keratitis punctata and peri-keratitic injection. On *July 10th*, I again saw the case. The eye had absolutely returned to normal, and showed no sign subjective or objective of the attack of iritis. Miss F. had had a severe attack of influenza shortly before the iritis started.

The effect of these tragedies has been to alter entirely my opinion about sclerotomy. A year ago I was beginning to be suspicious that the dangers, difficulties, and complications of these new operations were not balanced by an obvious superiority over iridectomy. The statistics referred to above tended

to confirm this suspicion. Now I fully realize that the danger of late infection is no myth, no occasional happening; fully twenty per cent. of my sclerotomies have been affected, and I now know from a sad but illuminating practical experience that a patient with a filtering scar may be said to live upon the slopes of a volcano; late infection may befall him at any moment. A slight conjunctivitis is for him a serious disease menacing the very existence of what may be his only useful eye. I am fully aware that I shall be told that most of my cases were punch operations, and that my experience cannot be applied to the other operations. I answer that the outward appearance of the resulting cicatrix is exactly the same for both operations, and sections show no material difference. Again, late infections have been reported by Hill Griffiths and Axenfeld after trephining, and Mr. Evans had one after a wedge isolation operation. The danger is inherent in the filtering scar and I see no way of combating it. In the April number of *Ophthalmology*, Dr. F. E. Cheney on page 45, referring to trephining says: "It is not a simple operation and there are various complications which may arise. ***Late infection***, I venture to say, will become more a factor to be reckoned with than may seem probable at the present time. A certain number of such cases have been reported, and it is safe to say that a goodly number have taken place that have not been reported."

We are now in a position to answer the three questions I propounded at the beginning of this paper. We can group them together and say: iridectomy is so successful in acute glaucoma that it is quite unjustifiable to adopt a more complicated method of operating. Sclerotomy is far too dangerous in its remote effects to be the operation of election in even the majority of cases of chronic glaucoma; it should be reserved for examples of the disease in which iridectomy has failed, for cases where, owing to the extreme shallowness of the anterior chamber, iridectomy is technically more difficult than trephining, and for patients whose iris is so atrophic that iridectomy is manifestly futile. It is a great disappointment to feel that I must give up a procedure which has yielded me several excellent results, but, with the reservations mentioned, I feel very strongly that it is not the best primary operation. We can

always fall back upon the trephine or punch, but why employ them before the simpler and safer operation has been tried and has failed!

I would finally draw attention to the real danger of a button-hole, however small, in the flap. This seems necessary because some operators regard such a complication as trivial and one or two perform sclerotomy without cutting a flap at all, among them Dr. Casey Wood.

THE CILIARY GLANDS.[1]

By W. C. FINNOFF, M.D., Denver.

(*With ten illustrations on Text-Plates* XV., XVI., XVII.)

A STUDY of the structures found in the ciliary body is of the greatest interest. For it is presumably from this region that the aqueous humor is secreted. The parts concerned in the formation of this fluid have met with more or less discussion, and many interesting experiments have been performed to learn and to prove that special areas are involved in this function. But when looking over the literature on this subject one is surprised to find that little is at hand.

The experiments of Deutschmann, Schoeler, Uhthoff, Leplat, and Nicati seem to prove that the aqueous humor is secreted by the ciliary body. Nicati (1) claims that the aqueous humor is secreted by the epithelial layers covering the ciliary body from the ora serrata to the root of the iris.

Treacher Collins (2) first described the presence of gland-like processes projecting from the pigment epithelial layer into the substance of the ciliary body. These glands he concluded were concerned in the secretion of the aqueous humor, but he did not assert, as many have said, that they were the sole agents in the production of this fluid. Griffith (3) located gland-like projections which were similar to those described by Collins, but thought that their chief function was to produce the pigment and regulate its amount for this region. Alt (4) found many gland-like processes in the ciliary region, but unlike Collins and Griffith could find no lumen.

Sections of this region can be studied best when bleached,

[1] Candidate's thesis for the degree of Doctor of Ophthalmology, University of Colorado, 1915.

ILLUSTRATING DR. FINNOFF'S ARTICLE ON "THE CILIARY GLANDS."

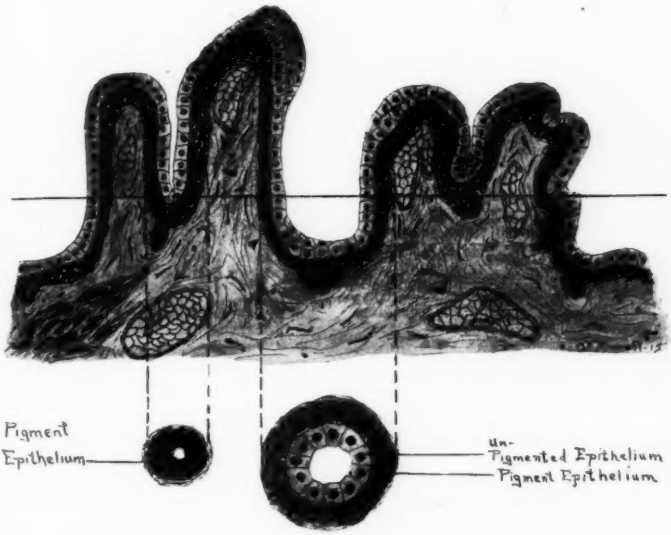

FIG. 1.

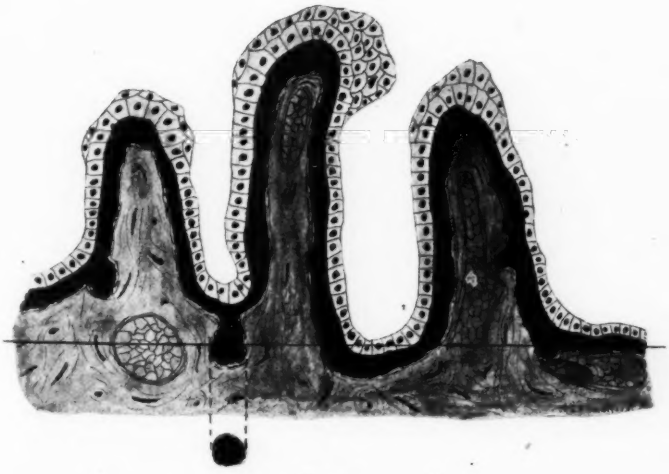

FIG. 2.

for where the ciliary pigment layer is very prominent it masks many important details. The methods of bleaching will be described under a separate heading.

A study of the development of the ciliary region will be most advantageous at this time. It does not make its appearance in the embryo until later than the other structures of the eye. In the primary optical vesicle we find no differentiation between the layers of the retina and the ciliary body.

It is not until the third month of embryonic life that marked changes take place in the ciliary region and the iris. At this time the cornea and lens have undergone marked changes in development. The first development sign in the ciliary portion of the retina is a thinning out of the retinal layers; this is somewhat abrupt when compared with the thicker retina, and corresponds to what is later termed the ora serrata. The thinned ectoderm is soon replaced by high cylindrical epithelial cells growing in from the edge of the cup. The pigment epithelium also is becoming thicker and more cylindrical with the nuclei placed in uneven rows. At this time a small annular space at the margin of the lips of the cup can be noticed between the inner and outer epithelial layers and is termed the marginal or circular sinus, and is obliterated during the seventh month of fetal life.

During the latter part of the third month the ciliary part of the optic cup is thrown into radial folds, as if by too rapid growth of this portion, and is the "anlage" of the ciliary processes. The mesoderm with its small vessels projects and forms a basement membrane upon which the epithelial cells rest. In the ciliary mesoderm can be seen the beginning of the ciliary muscle, and its fibers show a meridional arrangement. At this stage we see this muscle farther posterior than in adult life.

It is in the fifth month that the ciliary folds increase in size and number and their epithelial coverings become larger and more pigmented, resembling the adult ciliary processes. In the processes and body at this stage, the muscle has increased and formed radial and meridional fibers, but towards the end of the month the meridional fibers predominate and form the true Brücke's muscle. At the latter part of the fifth month the development of Müller's muscle has started; it is first

seen in the anterior part impinging upon the root of the iris. The appearance of this muscle increases the size of the ciliary body, and the posterior portion of the body begins to fill the gap between the ciliary body and the ora serrata.

In the seventh month retrograde changes take place. The mesodermal framework atrophies and reduces the space between the anterior chamber and the ciliary body. Brücke's muscle shows no changes, but the Müller muscle increases in size.

The eighth month shows slight increase in the size of the ciliary processes, but not in number. The position of the body is advanced toward the free-chamber angle, and the ora serrata has receded. The muscular portion remains stationary.

There is some growth during the ninth month, but complete development does not take place until some time later, after birth. Both muscles increase in size and come closer together. The ora serrata is now behind the ciliary body and lies in the region of the choroid (5).

The minute anatomy of the ciliary body is described admirably by Hess (6), and his illustrations make clear this complicated ocular organ. Salzmann's (7) book describes very minutely the different structures found in this region, and has many valuable illustrations which will help one in studying the tissues of this body.

The outer layer of the ciliary body is composed of smooth, non-striated or involuntary muscle fibers, having spindle-shaped cells with oval nuclei. The outermost fibers are placed in a meridional direction and form Brücke's muscle, which is subdivided into tensor choroidea or outer portion and the inner radiating fibers. Müller's muscle is found more internally than the Brücke's and runs equatorially; this muscle is the true compressor lentis. The size of the muscle varies in different eyes, being strongly developed in hyperopic and poorly in myopic individuals. These muscles are found coursing from the other portions of the ciliary body to the pigment epithelial layer.

Behind the root of the iris in meridional sections of this region, cross-sections of the circulus arteriosus major are noted. These furnish the arterial blood to this portion of the ciliary body and to the iris. Large veins are not seen; the

ILLUSTRATING DR. FINNOFF'S ARTICLE ON "THE CILIARY GLANDS."

FIG. 3. Showing four pigmented epithelial plugs. The upper one with a light center has a lumen. From bleached section.

FIG. 4. Showing the relation of the blood-vessels to the pigmented epithelial layer.

FIG. 5. Small and large plugs of pigmented epithelium protruding into the substance of the ciliary body.

FIG. 6. Isolated oval area of pigment epithelium deep in supporting structure of a ciliary process.

venous blood courses backward through small vessels and passes outward through the sclera by way of the anterior ciliary veins.

The nerves are seen to branch before entering the muscle; they first produce a wide meshed plexus, and break up as they pass on through the muscle. The nerves are medullated, and in the plexus, ganglion and bipolar cells are found; they are probably motor cells for the muscles of this area.

The vascular layer is directly continuous with the layer of the same name located on the choroid. This layer contains veins of varying caliber, which run parallel with occasional anastomosis. Their course is toward the choroid. There are a few small arterial twigs scattered through this layer, but the veins predominate. Most vertical sections will reveal very large oval blood channels, while specimens cut transversely show cross-sections of the vessels.

The vessel layer of the ciliary body is similar histologically to the same layer in the choroid, except that chromatophores are less numerous, and toward the anterior part are almost absent in many eyes.

The ciliary processes contain thickened vessels which give an uneven appearance to the surface, producing the plicæ ciliares and the warts in the valleys. Each ciliary process conceals a richly subdivided framework of wide capillaries and small veins which are supplied by a small artery from in front, and the veins send branches backward into the orbicularis ciliaris.

Within the lamina vitrea choroideæ the elastic lamina is contained. It forms the inner limitation of the vessel layer of the orbicularis ciliaris and the posterior part of the corona ciliaris. This layer is best seen when stained with orcein.

The next layer is termed the interlamellar connective-tissue layer, and is evidently a continuation of the delicate collagenous fibrillæ found between the two layers of the glass membrane of the choroid. When the specimen is stained with Van Gieson's the details of this layer are best seen. It is devoid of blood-vessels, although this layer merges with the blood-vessel layer. The nuclei are elongated and many fibrillæ are present which have a meridional course.

The cuticular lamella covers the whole of the ciliary body as

far forward as the root of the iris. It is thickest in its anterior portion, the other being very thin. This layer is continuous with the glass membrane of the choroid and by the older authors is called the glass membrane of the ciliary body.

For an understanding of the various layers of the ciliary body from without in, it is necessary to describe the organ, but the part that concerns us most in this paper is the epithelium. There are two layers: the outer pigmented and inner non-pigmented. There are differences of opinion as to their function, but it is claimed that both layers are concerned in the secretion of the aqueous humor.

The outer or pigmented epithelial layer (pars ciliaris retinæ) is directly continuous with the pigment epithelium of the choroid and consists of a single layer of pigmented epithelial cells. The pigment differs from that of the choroid in that here the granules are larger, and rounded, resulting in a darker appearance of this layer in the ciliary region.

In the various portions of the ciliary region the pigment epithelium is different. Just in front of the ora serrata, in the smooth area, the cells are 6μ broad and 18 to 23μ high, are cylindrical, and have oval nuclei with their long axes placed at right angles to the inner surface of the ciliary body.

The meshes of the reticulum are filled with pigment, the layer of pigmented cells dips into the depressions, and the cells become irregular and polyhedral in form. Invaginations into the outer portion of the ciliary body were first described by Treacher Collins in 1890. Bleached sections were prepared and he found that protruding from the pigment epithelium toward the ciliary muscle were numerous little processes, each composed of cells, which he found on cross-sections to be tubular, and these he concluded were concerned in the secretion of the aqueous humor and the nutrient fluids of the vitreous. In a second article (8) he makes clear that the recesses between the ciliary processes or any of their convolutions were not considered true ciliary glands as seemed apparent from his first description.

The glands which bear his name are definite tubular outgrowths of epithelial cells from the pigment layer only. They are found between the ora serrata and the root of the iris; projecting from the outer surface are numerous processes each

ILLUSTRATING DR. FINNOFF'S ARTICLE ON "THE CILIARY GLANDS."

FIG. 7. Ciliary processes and epithelial plugs.

FIG. 8. Area cut transversely, or on the flat. Showing how easily a cross-section of a valley, between the processes, might be mistaken for a gland.

FIG. 9. Showing how both layers of epithelium are frequently found in transverse sections. These areas have somewhat the appearance of glands.

FIG. 10. A protrusion of pigmented and non-pigmented epithelium into the ciliary body. If this area was cut at a lower level, the non-pigment epithelium might not be present and the pigment epithelium could resemble a gland composed of pigment cells.

composed of a group of cells. These vary in size and number in different parts of the ciliary body. Thus in the anterior portion of the plicated part they are small, few, and far apart, confined to the depressions between the ciliary processes, none being situated at their apices. In the posterior portion of the plicated part, at its junction with the non-plicated part, they are the largest, and most numerous. Here they are pear-shaped, connected by the stalks with the epithelial layer, and their rounded ends project toward the ciliary muscle. Many can be made out to have two parallel rows of cells, and a lumen was found by Collins and Griffith but not by Alt. Rutteman (9) examined eighty specimens of eyes for the glands of Treacher Collins; the eyes had been affected by various diseases; some had increased and others decreased tension, and were secured from all ages. He did not find a lumen in any of his specimens and found no branched processes. He attributes the dipping in of the pigment layer to its passing through gland-like processes into the underlying ciliary structure.

In transverse sections Collins found in each projection a small central lumen surrounded by a single layer of pigment epithelium, which rested on a distinct basement membrane. He concluded that they were true glands and were subjected to catarrhal inflammation similar to that seen in glands elsewhere, thus producing the train of symptoms associated with serous iritis, or, as better termed by Mackenzie in 1835, serous cyclitis.

Alt found no lumen in the projections of the pigment epithelium, but sections examined by him were cut meridionally or equatorially; in bleached and unbleached sections his results were the same. Collins (2) suggests that Alt had not examined bleached sections cut transversely. It was in sections cut in the latter direction that Collins was able to demonstrate best the existence of a lumen in the gland-like projection.

There are several methods of bleaching the pigment epithelial layer, but all are difficult and require much patience. Good sections before the bleaching reagent is applied are apt to become very brittle and hard to handle without breaking, after the solutions have been used.

The most satisfactory results are obtained with chlorine water. The technique is as follows: After the tissues have

been hardened, dehydrated, impregnated with celloidin or paraffin, and blocked, they are cut and the sections are exposed to chlorine water for twelve to twenty-four hours or longer if they are not thoroughly decolorized. The sections are then stained in the usual way, dehydrated and clarified before covering with Canada balsam.

Another handy method is the use of hydrogen peroxide instead of chlorine water. The sections are subjected, first to ten per cent. alcohol, next to distilled water for a short time, and then exposed to peroxide of hydrogen from twenty-four to forty-eight hours in sunlight if possible.

Fick (10) recommends a saturated solution of bichromate of potash three parts to one part of dilute sulphuric acid as an excellent and satisfactory bleaching agent. Sections in a cold solution are bleached in three-quarters of an hour, and a shorter time is required if the process is carried out at a higher temperature. My most satisfactory results have been obtained by subjecting the sections to this solution at room temperature for twelve hours. This method is very satisfactory, for celloidin sections are not made brittle and are easily handled and stained after bleaching.

Internal to the pigment epithelium, we find covering the whole of the ciliary region a layer of epithelial cells which in the posterior portion are comparatively free from pigment, but as we follow this layer forward we find a very gradual transformation to pigmentation of the cells, without a definite line of demarcation. The gradual pigmentation gives the anterior portion near the root of the iris a darker color than the posterior portion covering the ora serrata.

This layer is composed of cells which vary from cylindrical to cuboidal. Behind the cells are cylindrical, measuring 6 to 9μ broad and 30μ high, with elongated nuclei situated in the outer portion of the cell, but as we follow them forward the cells become more cuboidal, being 12 to 15μ broad and only 10 to 15μ high with rounded nuclei located near the center of the cell. At the apices and in the bottom of the valleys formed by the ciliary processes, several layers of epithelial cells are seen. The striated appearance is especially striking at the apices of the processes in some sections.

The internal limiting or glass membrane is the innermost

layer of the ciliary body. It is directly continuous with the internal limiting membrane of the retina. It is a structureless membrane resembling a clear coagulated fluid, which dips into the intervening gaps and spaces, but plays no part in secretion of the ocular fluids.

To the outer pigmented and inner non-pigmented layers, especially the portion which covers the ciliary processes and the valleys between them, Nicati (1) gives the name of aqueous humor or uveal glands. He divides it into two portions, the posterior extending from the ora serrata to the root of the ciliary processes, and the anterior, of much more importance, following the folds of the ciliary processes to the root of the iris.

Nicati explains the secretion of the humor from this region as follows: the ciliary epithelium rests upon a layer of vessels which are expansions of the chorio-capillaris, and its nutrition is found to depend on these vessels as a whole. He claims that the capillaries are contained between two impermeable walls, the internal vitreous lamina within, the external limiting membrane without. When serum transudes from the capillaries it cannot escape through the walls of the sac, but must find its way out in front where, through disappearance of the vitreous lamina, the sac lies open to the glandular epithelium of the ciliary region. For this reason the chorio-capillaris has been called the source of the aqueous humor.

Experiments prove that the aqueous is secreted by the ciliary body, but at present nothing has been either proven or disproven, that the so-called glands described by Collins are concerned in this process.

The fluid in the anterior chamber contains no albumin, but after tapping and withdrawing the aqueous that which is then secreted contains it, and when this fluid is examined under the microscope fibrin is found. This tends to prove that fluid which is formed rapidly is a transudate from the blood-vessels which lie close to the surface of the ciliary body, rather than a secretion from that organ.

Injection of weak solutions of fluorescin into the circulatory system at varying intervals will not color normal aqueous, but after the withdrawal of the fluid that which refills the anterior chamber becomes colored. Examination of eyes from which the aqueous has been withdrawn and allowed to refill with the

colored fibrinous fluid reveals the following: aqueous of the anterior and posterior chambers is colored, but the walls of the chambers are not impregnated with the stain; the vitreous, lens, and retina proper are unstained, but the surface of the ciliary processes and the chorio-capillaris are strongly stained. The surface of the epithelium is unstained, but the substance between the cells is strongly colored.

These observations are taken from Nicati's experiments and seem to prove almost conclusively that the aqueous comes from the ciliary body. When filled rapidly it is apparently a transudate rather than a secretion, for if the fluid was secreted by the epithelium we would find the cells colored by the staining solution which had been injected into the circulatory system prior to the evacuation of the aqueous.

The epithelial cells of the ciliary body in the normal eye undoubtedly take some part in the transformation of the fluid portions of the blood into the aqueous humor. The pigment layer, it is claimed, plays the most active part in this process. This is a reasonable conclusion, because these cells lie immediately internal to the layer of blood-vessels, but before the fluid can reach the chambers of the eye, it must pass through the layer of unpigmented epithelium. It is reasonable to suppose that these cells further change the fluid and release it as pure aqueous humor free from fibrin in the normal eye.

The secretion of fibrin-laden aqueous is a reflex act produced by lowering of tension in the eye and reflex stimulation of the sympathetic nerves. Irritation of the iris stimulates the secretion probably through the sympathetic system.

Inhibition of secretion is dependent upon the fifth nerve. Stimulation of this nerve or the Gasserian ganglion diminishes the secretion, while severing it in front of the ganglion is followed by a more rapid flow. Removal of the iris is also inhibitory to the secretion of the ocular fluids.

Ten human and several sheep's eyes were examined. In bleached and unbleached sections projections of the pigment epithelium into the deeper portions of the ciliary body were found in most specimens. They extended from the ora serrata to the root of the iris and were more numerous in some eyes than in others.

Sections were made from eyes which were cut equatorially,

meridionally, and transversely across the ciliary body. Several specimens from each eye were studied to note the differences in arrangement of the structures at the various levels of the body. They were examined very carefully with the 16*mm*, 4*mm*, and 1.8*mm* oil-immersion lenses. A lumen was found in the projections of pigment epithelium in only one specimen. The section was one that had been bleached and unfortunately had not been washed long enough in water after being removed from the bleaching reagent and contained enough of the solution to partially bleach the stains which were used in coloring the specimen. It is for this reason that the photo-micrograph of this area, which was taken with an oil immersion lens to give as much magnification as possible, is so hazy and indistinct.

It seems that the presence of a gland-like structure composed of pigment epithelium, situated deeply in the substance of the ciliary body, is highly improbable. If the projections from the pigment layer were glands, ducts would have been found piercing the unpigmented epithelium to give an outlet to the fluid which had been secreted by the gland cells. It does not seem logical to have this an internal secretion, which in some unknown way flows from the glands located deeply in the ciliary body into the chambers of the eye.

As mentioned before, the pigment epithelium undoubtedly plays some part in secretion of the aqueous. The isolated pigmented plugs with or without a lumen probably have the same identical action as that which does not dip deeply into the substance of the ciliary body. And they can be called glands only in the same sense as the other pigmented epithelium of this region.

The most probable explanation for the presence of a lumen in the center of the pigmented epithelial cells is that, during the process of fixing and hardening, the tissues become more or less contracted with a pulling apart of some areas. If this takes place in or near an epithelial plug the cells would contract and the result would be an artefact resembling a lumen. Cross-section of this would look like a tubular gland cut crosswise. This phenomenon has come under my observation many times, in preparing and examining tonsillar crypts.

Another possibility for this appearance is that, in cutting

sections transversely, or on the flat, the valleys between the ciliary processes had been cut at the junction of the pigmented with the non-pigmented epithelium, and the appearance of a lumen obtained. Fig. 1 is a diagram drawn in an attempt to explain more clearly this theory.

A third theory which has been proposed by others is that muscular contraction has thrown the epithelial layers into folds and the pigment layer has projected into the substance of the body at the time of hardening.

Figure 2 shows how cross-sections of this region might resemble tubular glands cut crosswise. An area as represented in the illustration seems to have a duct, but in all sections examined no lumen was found in any of them and all seemed to be a simple dipping in or thickening of the pigment layer.

The presence of the so-called glands of Treacher Collins is doubtful, and when seen with a lumen, as stated above, are probably artefacts. The aqueous humor and nutrient fluid of the vitreous are probably secreted by both layers of epithelium, which cover the ciliary body from the ora serrata to the root of the iris. The pigment epithelium probably plays the most active part because of its location. It is close to large and numerous blood channels (Fig. 3). The serum is probably partially changed by the outer layer and completed by the inner non-pigmented epithelium in the normal eye.

The photo-micrographs were taken by Dr. R. C. Whitman of the University of Colorado, to whom the author is much indebted for his kindness, in permitting him to do much of his work in the University laboratory.

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MALIGNANT UVEITIS TREATED WITH THYROID EXTRACT.[1]

By JAMES BORDLEY, Jr., M.D., Baltimore, Md.

(With one text-illustration and five charts of the visual change)

THERE are several well recognized varieties of uveitis, ranging from the mild form seen as an evidence of senility to the malignant chorio-cyclitis. As the cases which are to be considered here belong to a rather rare form I shall speak of their symptomatology.

Except for intensity, the symptoms were the same in all of the patients. The course of the disease was slowly progressive. The first evidence of trouble was photophobia; this was followed by loss of visual acuity. Coincident with the failure in vision, exudates appeared on the posterior corneal surface. These exudates were of two forms: small dots located near the inferior border, in places becoming confluent and forming irregular masses; and large plaques with a dense opaque center and translucent edges. The latter seldom exceeded four or five in number and frequently disappeared, leaving scar tissue to mark their former location.

Dilatation of the pupil and a greenish discoloration of the base of the iris were early symptoms. The discoloration of the base we regarded as an atrophy, as the iris apparently never regained contractility and reacted neither to light nor accommodation. When the conjunctiva was closely studied by oblique illumination and magnification a large number of cysts

[1] Read at meeting of Am. Ophth. Soc. at New London, Conn., July, 1915.

were found in the bulbar portion, encroaching in places on the epithelial layer of the cornea.

The formation of the vitreous cloud in the cases watched from the start of the disease was very curious. It looked at first not unlike a thin, dotted veil suspended in the vitreous chamber. The mesh of the veil became more and more coarse and the dots larger and larger until the whole formed a homo-

Exudates on the Cornea.

geneous translucent mass filling the chamber and obscuring the retina.

In one case the optic disk was slightly hazy, and in all five engorgement of the retinal veins was noted. The intraocular tension, at first normal (about 20–25), increased as the disease advanced, in one case reaching forty-five. There was in every instance a secondary decline, dropping in two cases to five.

All of the patients complained bitterly of photophobia, the eyes were tender to touch, and there was limited injection of

vessels of the deep circumcorneal zone. The fields of vision were, until dimmed by vitreous haze, normal.

A careful physical examination was carried out in all of these patients by eminently qualified internists and in not one was a lesion found in any of the so-called vital organs. Wassermann tests were made in every case by Dr. Albert Keidel who is in charge of the Department of Syphilis at the Johns Hopkins Hospital. The results of his work will be taken up in the case reports.

In every case there was a positive tuberculin reaction; the von Pirquet and injections of "old" tuberculin were both used. In three of the patients, the reaction to "old" tuberculin was very marked both constitutionally and in the diseased eye. In all, the percentage of hæmoglobin and the red-cell count, indicated anæmia. The kidney functions were normal and in but one case did we discover albumen. The mouth, nose, and throat of every case were carefully studied and X-ray pictures made of the teeth and nasal sinuses.

The treatment of the ocular condition of these patients included: mercury, iodide of potassium, pilocarpine, and sweat baths. As a positive tuberculin reaction, a low-grade afternoon temperature and loss of weight had to be considered in each instance; fresh air, milk, eggs, and rest were insisted upon. Subconjunctival injections of sodium chloride and bichloride were given without the slightest apparent improvement except for the relief of pain.

There was one medicine used the results of which so impressed all of the physicians associated in the treatment of these patients that I feel justified in calling it to your attention. I speak of thyroid extract. A fairly large and by no means pleasant experience in the treatment of malignant uveitis has convinced me that in these cases we have to deal with two factors: an infection, and an eye that makes a strong defensive, but lacks the something necessary to an offensive, fight. Wishing to test this hypothesis, I started several years ago to feed patients suffering from uveitis with extracts of various tissues of the eyes of sheep, hogs, and calves. The sum of these experiments was failure to accomplish anything. Still having faith I fed patients on the chemicals necessary for tissue upbuilding and with no more success. It was about this time

that I was fortunate enough to see a patient who, with malignant uveitis and a positive Wassermann, resisted the most strenuous antisyphilitic treatment. This patient also had patches of thickened skin, was morose, and suggested the possibility of a rather atypical myxœdema. Thyroid extract was ordered with a hope that it might be of help in the treatment. The change for the better was so immediate and striking that it prompted me to make a search for patients with outspoken hypothyroidism. I had the privilege of examining a fairly large number of such cases and found two with active uveitis, and four with lesions clearly the result of former malignant uveitis. I also ran across the history of another case in which, following a thyroidectomy, "extensive vitreous changes" made their appearance. This latter case interested me very much, because, with the introduction of thyroid extract, made necessary by other symptoms, the vitreous opacities disappeared. That my observations were not the first to point to the relationship of hypothyroidism and uveitis is made quite clear by an article on the subject by Demets.

I do not wish it inferred from what I have said that I believe that malignant uveitis is necessarily a symptom of cretinism or myxœdema. My own experience has left quite a different impression; indeed I have seen one case—a patient of Dr. Howard Kelly's on whom a pan-hysterectomy had been performed—resist all thyroid treatment and clear up only after taking ovarian extract for about two months, and another patient who responded neither to thyroid nor any other treatment. My only idea in presenting this subject is to get before you the successful results of the use of thyroid extract in patients suffering from the type of malignant uveitis which I have above outlined.

In all, eight patients have been treated: four with marked success, two must be classed as doubtful, and two as failures. Of this number I am able to discuss only five, as the records in the other cases are not yet completed.

The charts to be shown will illustrate the effects on vision, and I can assure you that the vision was a good index of the progress of the disease.

CASE I (Chart I.)—The first patient to whom I wish

to call your attention was a woman, aged 45, who in spite of treatment lost both eyes. The left eye was first affected, and in 1907 she presented herself with a history of decline in vision in the eye following a severe attack of tonsillitis and rheumatic fever in 1906. She had all the symptoms outlined above in a very tense form, the vision was reduced to counting fingers, and the tension was noted as high normal. A physical examination made by Dr. T. R. Brown was negative and tuberculin reaction positive. The teeth and tonsils were removed and the latter were examined for evidences of tuberculosis, but without success. Injections of salicylate of mercury were given and the patient sent to the mountains. The disease progressed and the patient was brought home, given pilocarpine and sweat baths without obtaining any benefit. The tension of the eye gradually declined, the pupil became closed by an exudative mass, and in spite of operations and medicines the eye was lost.

After a lapse of three years the right eye became affected and developed the same malignant type of uveitis as the left. As the treatment of the first eye had utterly failed, it was determined to adopt a different line of procedure with this second eye, so small doses of tuberculin were given for three months, most of which time the patient was kept in bed and gorged with milk and eggs. During this period the eye steadily lost ground both objectively and subjectively so it was thought unwise to continue the tuberculin. Courses of mercury, pilocarpine, and later salvarsan were instituted. No improvement was noted except from the last, and this was only transitory.

During the first months the tension was "high normal," then a steady decline was noted, the tension falling as low as five.

After being under constant observation for fourteen months she drifted away and sought consolation and assistance of "Christian Science." Some months after, she again came for consultation. It would be hardly fair to say that the fully mature cataract which she then had resulted from the efforts of the "healer," but whether this was so or not it necessitated an operation, which, as was to be expected, helped but little.

In October, following the cataract operation in January, thyroid extract in one-grain doses was given twice a day. The vision improved sufficiently in one month to enable her to come to my office alone. Unfortunately in spite of the gain in vision the thyroid had to be from time to time discontinued on account of loss in weight and strength, and eventually had to be given up as a point was reached where fainting attacks and palpitation became alarming. At the

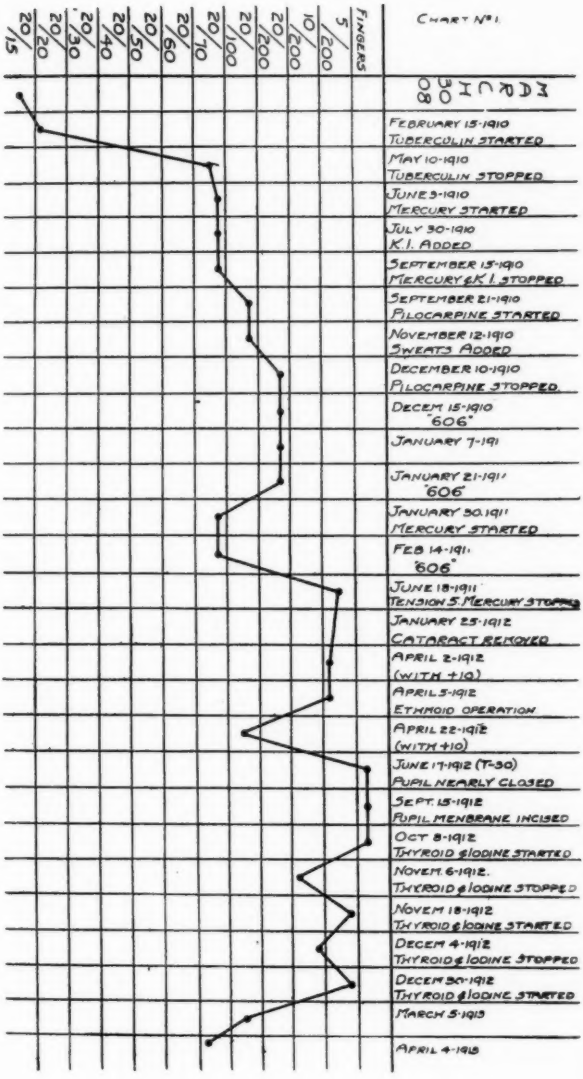
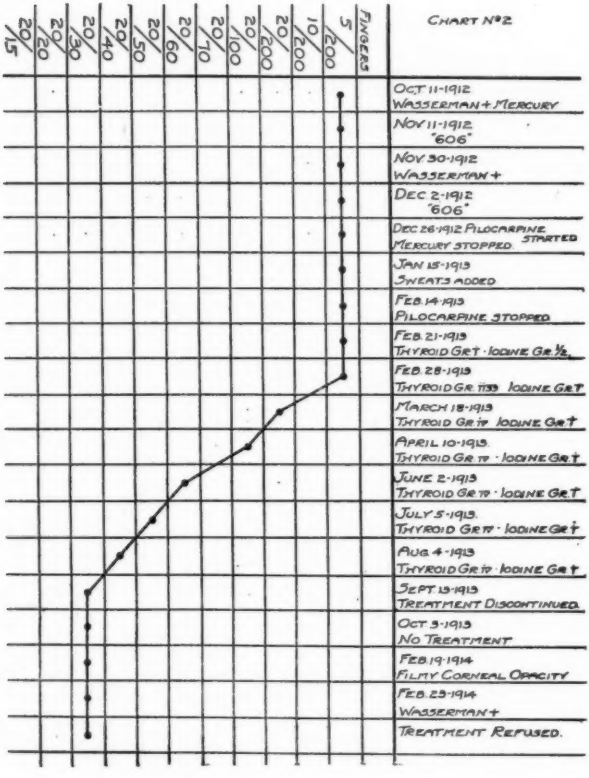


CHART Nº 1
20/15
20/20
20/30
20/40
20/50
20/60
20/70
20/100
20/200
20/200
10/200
5/200
FINGERS
FEBRUARY 15-1910
TUBERCULIN STARTED
MAY 10-1910
TUBERCULIN STOPPED
JUNE 3-1910
MERCURY STARTED
JULY 30-1910
K I. ADDED
SEPTEMBER 15-1910
MERCURY & K I. STOPPED
SEPTEMBER 21-1910
PILOCARPINE STARTED
NOVEMBER 12-1910
SWEATS ADDED
DECEMBER 10-1910
PILOCARPINE STOPPED.
DECEM 15-1910
"606"
JANUARY 7-191
JANUARY 21-1911
"606"
JANUARY 30.1911
MERCURY STARTED
FEB 14-1911
"606"
JUNE 18-1911
TENSION 5. MERCURY STOPPED
JANUARY 25-1912
CATARACT REMOVED
APRIL 2-1912
(WITH +10)
APRIL 5-1912
ETHMOID OPERATION
APRIL 22-1912
(WITH +10)
JUNE 17-1912 (T-30)
PUPIL NEARLY CLOSED
SEPT. 15-1912
PUPIL MEMBRANE INCISED
OCT 8-1912
THYROID & IODINE STARTED
NOVEM. 6-1912.
THYROID & IODINE STOPPED
NOVEM 18-1912
THYROID & IODINE STARTED
DECEM 4-1912
THYROID & IODINE STOPPED
DECEM 30-1912
THYROID & IODINE STARTED
MARCH 5-1913
APRIL 4-1913

time the extract was stopped the vision had improved from counting fingers to $\frac{1}{8}$, and it was indeed discouraging, to say the least, to return to mercury and watch the eye become blind.

CASE 2 (Chart 2).—The next patient, a girl of nineteen,



noticed a decline in vision starting about June, 1912. She was first seen October 8th of the same year; she then had a double chronic ethmoiditis, a positive Wassermann, and a positive tuberculin reaction. The conjunctiva of the left eye was somewhat congested and filled with small cysts, many dots were to be seen on Descemet's membrane, the

base of the iris was greenish in appearance, the pupil semi-dilated and did not respond to light, and the vitreous was a dense black mass.

As a physical examination made by Dr. T. R. Boggs and a gynecological one by Dr. Guy L. Hunner gave us no additional help, the patient was given mercury and salvarsan, but without benefit, for two months. Pilocarpine and sweat baths were used for two months without hindering the progress of the disease or easing the pain. She was then given small doses of thyroid extract and iodine, and as they were well borne the dose was increased to four grains of thyroid and one grain of iodine per day. After reaching the maximum dose it was necessary now and then to discontinue this treatment for short periods. Its effect on the progress of the disease can briefly be described by saying that her vision from February to September increased from $\frac{5}{200}$ to $\frac{20}{70}$, the vitreous cleared, and all inflammatory signs disappeared, leaving only a small corneal opacity the result of organization of one of the large exudative masses on the posterior surface of the cornea.

On June 21, 1913, her ethmoids were opened and polypoid tissue removed. This did not, so far as could be told, materially influence either the eye changes or the vision.

Practically two years have elapsed since the thyroid was discontinued and in spite of a positive Wassermann she has had no return of her trouble. Unlike the first patient, she steadily improved in health and weight while taking the thyroid.

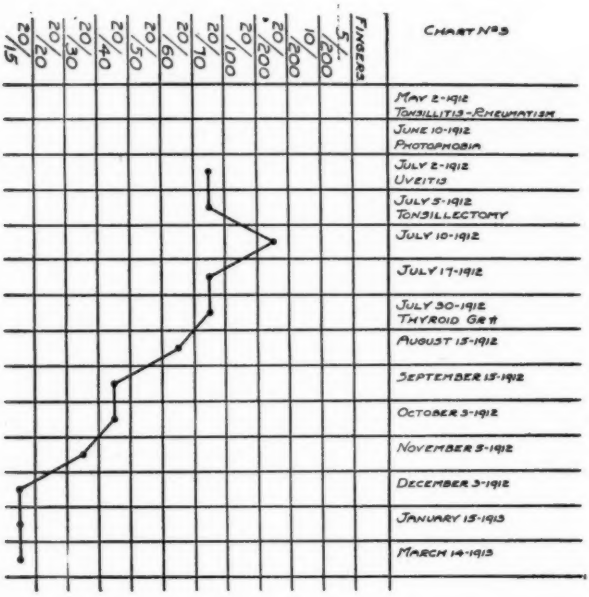
Case 3 (Chart 3).—The third patient, a nurse in the Johns Hopkins Hospital, following an acute attack of tonsillitis and rheumatic fever, developed within one month intense photophobia and a "red eye." She was in Canada on her vacation and did not report for examination until the vision of the offending eye, the left, had been much impaired.

A physical examination was made by Dr. W. S. Thayer, but nothing was discovered except "suspicious tonsils." Wassermann test was negative and tuberculin reaction positive.

There was slight ptosis of the upper lid, marked deep circumcorneal injection, cysts in the conjunctiva, discoloration of the base of the iris, dots on the posterior corneal surface, semi-dilated and non-responsive pupil, and vitreous opacities.

She was placed in the hospital and her tonsils removed. Time was given to watch the effect of the operation. At first the vision and ocular condition became worse, then a reaction set in which resulted in an improved condition.

When the vision had reached a point, and that far from normal, it became stationary, so twenty days after the operation thyroid extract was given. Following this there was a slow but gradual improvement until the vision became normal. The patient gained in weight and health and now,



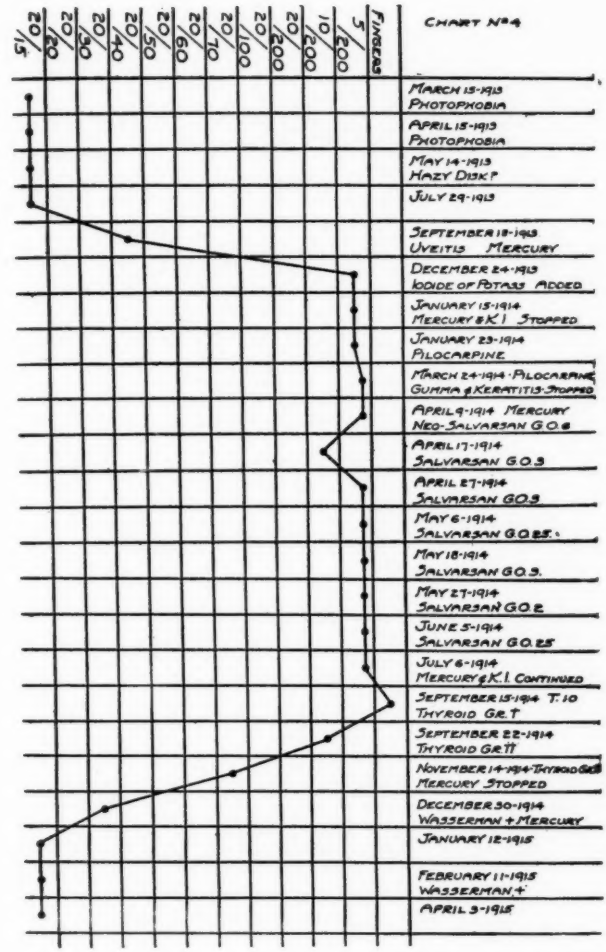
two years later, is a robust woman with nothing to show for her former eye trouble except a drooping lid.

Case 4 (Chart 4).—It is seldom that we see the first manifestations of congenital syphilis at the age of twenty-six, but in the fourth case of this series such a condition obtained.

The patient, a rather frail anæmic woman, complaining of persistent photophobia of the left eye, came for a consultation. I could find nothing to account for her distress, nor could Dr. Thomas Futcher to whom she was referred for a physical examination. She was kept under observation from March until July; during that time an abscessed tooth was extracted and a slight error of refraction was corrected.

Returning from my vacation on September 15, 1913, I found she had developed a definite uveitis of the left eye.

There were exudates on the posterior surface of the cornea, circumcorneal injection, a cloudy vitreous, conjunctival cyst,



a greenish discoloration of the base of the iris, and vision $\frac{12}{18}$. She was given mercurial injections and iodide of potassium for four months, and, as there was no improvement in the

ocular condition, pilocarpine was substituted and continued for two months. About the first of March, 1914, she contracted what her physician, Dr. Albert Chatard, supposed to be the influenza which was quite prevalent in Baltimore at that time. She was confined to her bed for several days and to her home for nearly two weeks. After convalescence, a purulent nasal discharge persisted and a small tumor of the left inferior turbinate, involving the floor of the nose, was discovered. She was referred to Dr. Keidel for Wassermann test, which proved positive. After blood of the husband and baby was tested and proven negative, the mother was confronted with the facts and confessed that her husband, whom she had divorced, infected her with syphilis three months prior to our patient's birth.

At the time the gumma—which the nasal tumor proved to be—was discovered, a slight cloud was noted in the interstitial tissue in the upper portion of the cornea. In spite of salvarsan and mercurial injections the corneal condition developed into a well defined luetic interstitial keratitis. The vitreous became more cloudy and the iris much inflamed.

She was given seven injections of salvarsan between April 9 and June 5, 1914. Her nasal condition cleared up rapidly but her eye symptoms persisted. Dr. Keidel was then obliged to discontinue the salvarsan "because of severe immediate reaction of so-called anaphylactic type." Mercury however was persisted in as the Wassermann reaction remained positive.

On September 15, 1914, the patient was still suffering very acutely and the interstitial keratitis was no better. At this juncture she was given thyroid extract, starting with one grain a day. Within a week there was a marked change for the better, and as she tolerated the thyroid perfectly the amount given was increased to two grains a day. The subsequent improvement in her vision and ocular disease was so consistent and rapid that I feel it must be attributed to the thyroid extract. Certainly it was not the salvarsan nor mercury alone which resulted in her recovery, because while the Wassermann remained persistently positive the vitreous cleared and the vision returned to $\frac{20}{20}$.

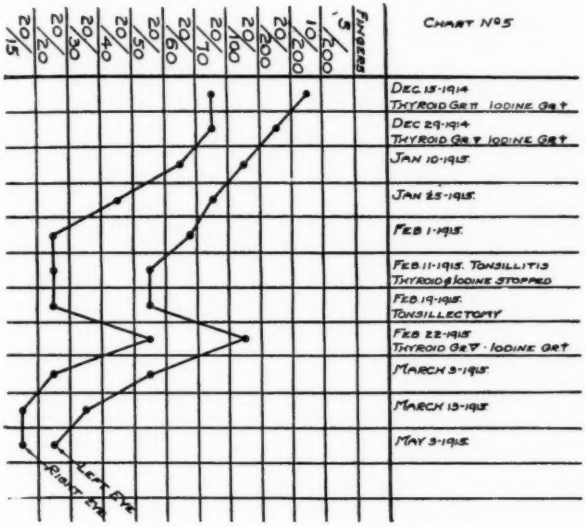
This case suffered both from uveitis and interstitial keratitis, nevertheless I feel it can be classed with the other cases which form the basis for this communication.

Case 5 (Chart 5).—The last case of which I wish to speak is a married woman aged twenty-four. She was sent by Dr. James S. McLester to Dr. W. S. Thayer and by him referred to me. To quote from Dr. McLester's history of the

case: "At six or seven years of age Mrs. C. had an enlargement beneath the angle of her jaw, believed to be sublingual adenitis. . . . At thirteen, while having dental work done, a rather alarming cervical adenitis involving the glands of both sides appeared. . . .

"The patient has been married two and a half years and has had two miscarriages. . . . This was believed to be due to some uterine disorder. . . .

"In the latter part of March, 1914, the patient became languid and had some fever. On the sixth of April there appeared a swelling in the parotid region of either side. . . .



There was little pain (but fever), and she remained in bed about six weeks.

"About two weeks after the appearance of the adenitis, double conjunctivitis was noted and, a little later, marked dilatation of the left pupil. She was examined by an oculist who noted double-sided retinitis. At first the vitreous was clouded, but this later cleared up. . . . She lost considerable weight during this illness.

"On June 28th . . . the lungs were negative, as was the heart. The blood pressure was normal. She was seen about this time by another oculist who reported double

neuro-retinitis and was strongly inclined to regard this as luetic.

"Her hæmoglobin was 70%, the leucocytes were 9,500. . . . The large number of eosinophiles suggested Hodgkin's. The feces were examined for ova with negative results. The urine showed albumen but no casts. The phthalein test gave normal values.

"A Wassermann test was negative. She was given mercury hypodermically and another Wassermann test was done, which also was negative. . . . In spite of the negative Wassermann, we gave Mrs. C. mercury.

"She improved distinctly for a while, though the fever never disappeared and we were never entirely satisfied regarding her eyes.

"Found two badly diseased molars. These were removed and distinct but incomplete improvement followed.

"Dr. Bunting could not be reached and some smears were sent to Dr. Yates, . . . who wrote: 'Suggestion of Hodgkin's, provided tuberculosis and acute adenitis could be excluded.'

"An enlarged gland just above the clavicle appeared, was removed, and sent to Dr. Bunting. He wrote: 'The condition is one of chronic hyperplastic tuberculosis.' . . .

"She was sent to visit her mother in Mississippi and hygienic measures advised. On her return a few days ago we found the general condition satisfactory, but the eyes no better, . . . particularly in view of a rather large exudate in the anterior chamber. I advised tuberculin therapy.

"One thing I don't feel entirely satisfied about: Her teeth probably play a rôle in this . . . and we have not followed up this clue as persistently as might have been done."

I have nothing to add to this history so thoroughly written by Dr. McLester. I might supplement his statement by saying that repeated Wassermann tests were in our hands negative and tuberculin tests positive.

The eyes were both involved in what we consider an undoubted malignant uveitis, as there were circumcorneal injection, exudates on Descemet's membrane, semi-dilated and non-responsive pupils, the base of the irides were of a greenish color, and the vitreous filled with opacities. The vision in the left eye was $\frac{10}{200}$, the vision of the right $\frac{20}{70}$. The fields were normal and tension was fifteen in each eye. She suffered very much from photophobia and the eyeballs were painful to the touch.

Dr. Thayer confirmed the report of anæmia and suggested that we look for possible points of infection.

The patient was given thyroid, one grain a day, gradually

increased to four grains. She was, at first, given occasional doses of pilocarpine and hot-pack sweat baths.

Her improvement, both physical and ocular, was prompt and steady until the development of a mild follicular tonsillitis brought it to a stop. Still even during this infection there was no loss.

As soon as thought safe the tonsils were removed by dissection. At first this appeared a tragedy from an ocular standpoint: her vision greatly declined, the photophobia and pain increased, and the exudates on the cornea greatly multiplied. After a lapse of three days, however, the thyroid, which had been discontinued, was renewed and from that time on there was rapid improvement in the disease until the vision became normal.

Some of the dots on Descemet's membrane in the left eye persisted for several weeks and a systematic examination of her teeth was made by Dr. C. J. Grieves who reported: "One tooth, the first lower right molar, with a gold cap has a blind abscess and should be extracted."

After the extraction of this tooth there was a decided decrease in the Descemetic dots in the left eye, and, in a letter just received the patient says: "My eyes are much stronger and can stand the light; look natural, and my vision is perfect. I have gained thirty pounds."

The only drugs given this patient were thyroid extract and iron. She could not tolerate atropine.

GRAM NEGATIVE DIPLOCOCCI OCCURRING IN THE CONJUNCTIVAL SAC

By ROBERT BLUE, M.D., Chicago.

RECENTLY there came under my observation the case of a girl showing the clinical symptoms of a mild conjunctivitis, the smears from whose conjunctiva showed an abundance of Gram negative diplococci as the most striking feature of the microscopic picture.

The investigation carried on at that time to determine the nature of these organisms suggested the topic of this communication.

Let us approach the subject from the standpoint of the clinician. We have before us a slide poor in cellular elements; it is strewn with a generous sprinkling of Gram negative diplococci, the number of which in proportion to the small amount of secretion is strikingly great; they lie for the most part outside of the leucocytes; there are present also a few Gram positive cocci and Gram positive bacilli which we accept on staining and morphologic grounds as staphylococci and xerosis bacilli. The very appearance of the slide is suggestive of a bacteriological diagnosis. This however is precluded in view of possible error without further evidence.

A loop of the material from the conjunctival sac is therefore transferred to tubes of hydrocele agar and Loeffler's blood serum and incubated for twenty-four hours. Following this technique the case under consideration showed a good growth on both media used. Staining showed this growth to consist of Gram negative diplococci and pseudodiphtheria bacilli By plating and subculturing pure cultures of the Gram negative diplococci were obtained.

This organism grew on agar, ascites agar, and Loeffler's

blood serum in the incubator and at room temperature. Wrestler's media remained unchanged and none of the sugars were fermented. These characteristics we deemed sufficient to identify the organism as the micrococcus catarrhalis.

What described organisms shall we consider as included within the limits of variability of the micrococcus catarrhalis?

Before answering this question allow me to remark parenthetically that a paper bearing the title superscribed to this one might perhaps more properly begin with a discussion of the gonococcus, both from the standpoint of historical sequence and from the fact that for many years all Gram negative diplococci occurring on the conjunctiva were regarded as gonococci. Even as recently as 1908 it was necessary to controvert the opinion of Schantz that all Gram negative diplococci are identical.

Bumm (1) gives the first records of Gram negative diplococci other than the gonococci. He lists the following:

(1) Micrococcus albicans amplus—larger than the gonococcus, grows on gelatine slowly.

(2) Diplococcus albicans tardissimus—resembles the gonococcus, grows on gelatine slowly.

(3) Micrococcus subflavus—grows at room temperature, does not liquefy gelatine.

Axenfeld (1) does not allow that the second of these organisms is Gram negative, saying: "The single statement of Bumm that the diplococcus tardissimus is Gram negative cannot be allowed."

Marthen (1), working in Haab's clinic, three times found Gram negative cocci which were probably micrococcus catarrhalis.

Krugenberg (1), Kayser (1), Brons (1), Axenfeld (1), and others have all reported the finding of Gram negative diplococci on the conjunctiva which from their cultures could not be considered gonococci.

The Abelsdorf-Neumann diplococcus was found by these men in the secretion of three cases of postoperative conjunctivitis after cataract. They identified it with the diplococcus albicans tardissimus of Bumm, but since this organism is not considered Gram negative by subsequent investigators, it is dignified by prefixing their names to it. It differs from the

typical catarrhalis in that it forms milk-white colonies on agar and slowly liquefies gelatine.

Von Lingelsheim has described a number of Gram negative cocci under the names diplococcus pharyngis cinerus, flavus, and siccus as occurring in the throat.

All of these organisms are to be considered as included within the limits of variability of the micrococcus catarrhalis of Pfeifer.

The old idea that microörganisms are immutable entities is no longer extant. They need no longer conform to a classical type with definite limitations and characteristics to which they adhere under all conditions and environments.

On the contrary it is recognized that an organism varies with a varying environment, and further, that certain individual organisms bear so close a resemblance to one another in usual habitat, morphology, staining reaction, and cultural characteristics that it is both convenient and necessary to gather them into groups, and we attempt to assign to the groups, group characteristics.

It would be no more just to deny to an organism membership in one of these groups because it showed some minor variability than it would to deny to an individual membership in his social group because he happened to be red-headed.

Moreover by artificial means it is possible so to change the members within a group that they will assume the characteristics of other members of the same group or of allied groups.

It would be a mistake to conclude from what has been said that this grouping of the organisms is either cumbersome or confusing. The very opposite is true. The groups are natural divisions, they follow natural lines of cleavage, and the variations within the groups afford a rational explanation for many of the pathological variations so frequently noted and so frequently confusing.

The Gram negative diplococci found on the conjunctiva fall into three such groups—the micrococcus catarrhalis, the micrococcus intracellularis, and the gonococcus.

Brons, who has studied these organisms extensively, concludes that they are members of the same family.

This family relationship is emphasized by the agglutination phenomenon which they exhibit. In response to the general

principle that a concentrated solution of a serum of a definite bacterium is able to agglutinate bacteria which are allied to it, these three Gram negative diplococci interact. That is to say a concentrated serum of any one of these organisms will agglutinate all three members of the family. It is only when such a serum is used in high dilution that it becomes of value for the purpose of differentiation.

Of these organisms the micrococcus catarrhalis is the most vigorous and resistant. It is found commonly on the mucous membrane of the nose and throat, from which circumstance it derives its name. The conclusion reached by many authors that the meningococcus also is commonly found in the nose under normal conditions is erroneous and is doubtless drawn from the fact that it resembles the catarrhalis.

The catarrhalis grows on all the common media both at incubator and room temperature. This distinguishes it from other members of the family which grow only at incubator temperature.

It has a tendency to develop large forms when in culture and tetrads commonly occur. Neutral red litmus whey becomes blue. None of the sugars are fermented.

The catarrhalis is a pathogenic organism. Injected intraperitoneally, intravenously, and subcutaneously into rabbits and guinea-pigs it produces no results. Injected intraperitoneally into mice it produces diarrhea and death.

On the conjunctiva of man it is probably capable of producing a mild, self-limited inflammation.

The meningococcus intracellularis occurs very infrequently on the conjunctiva. There are few unquestioned demonstrations of its presence there.

It does occur here, however, and that too on the conjunctiva of healthy individuals who have not been associated with those sick with meningitis.

The various reported cases falling in this class are interesting.

C. Frankel (2) reported the first purporting to be such in 1899. Frankel's meningococcus is questioned however on the ground that it decolorizes incompletely by Gram and forms chains in cultures.

Haglund's (3) case reported in 1901 showed only diplococci in the secretion, some intracellular. However on cultivation

it showed at first diplococci, then long chains, and was Gram positive. It must be concluded therefore that he dealt with streptococcus.

Moisonnier (4) in 1907 reported before the Ophthalmological Society of Paris the case of a fourteen-year-old child having a pseudomembranous conjunctivitis accompanied by an albuminoid, grayish white discharge and complicated by a perforating ulcer of the cornea (two perforations) which he said was due to the meningococcus. He submitted cultural proof which was not so conclusive as to induce universal recognition of his case.

From Axenfeld's clinic, Brons (5) reported the case of an eleven-weeks-old infant with an acute blennorrhœa and keratomalacia. In the discharge were found pneumococci and Gram negative, intracellular, biscuit-shaped organisms. Cultural, agglutination, and sugar fermenting tests showed it to be a true meningococcus. The pneumococci disappeared from the secretion the first day, the meningococci were found for two weeks.

MacKee (6) (1908) reports the isolation of the meningococcus from the normal conjunctival sac in a boy who came to his clinic for glasses.

Lutz (7) (1910), from a case of catarrhal conjunctivitis.

Verderame (8) (1912), working in Axenfeld's clinic at Freiburg, from a shoemaker forty years old who came to the clinic for glasses.

Of more frequent occurrence are the cases suffering from meningitis having at the same time a conjunctivitis the discharge from which shows meningococci. Koplick (9), Smith (10), Gabrielides (11), Robinson (12), Councilman (13), Davis (14), MacKee (15), Ishii (16), and Anargyros (17) all report from one to many of such cases. In fact a conjunctivitis complicating a meningitis is a frequent clinical observation.

But it would be a mistake to conclude from such a clinical observation that we are dealing with a conjunctivitis due to the meningococcus, for both Brons and MacKee have reported cases suffering from meningitis having at the same time a conjunctivitis the discharge from which showed Gram negative diplococci which were not meningococci.

On the other hand, the fact that no organisms are found in

the discharge from a conjunctivitis in a meningitic patient is no proof that we are not dealing with a meningococcic infection, for the occurrence of a metastatic meningococcic conjunctivitis is among the possibilities.

This list of reported cases, which is fairly complete, shows how infrequently the meningococcus is found on the conjunctiva. This fact has a very important clinical bearing.

The differentiating of the meningococcus from the gonococcus at times presents great difficulties.

The usual points of differentiation, viz., that the meningococcus grows freely on serum media, grows on glycerine agar, and produces acid in glucose, while the gonococcus grows only on serum media and here produces but a scanty growth, is sufficiently accurate for clinical purposes. The ultimate differentiation required by research is not to be stated in such simple terms and depends upon the variability which the different strains present, the limits to which are still under discussion.

The point of distinction depending on the difference in the vigor of the growths on the different media is not so certain as was once thought, for while it is generally true that the meningococcus grows most strongly on blood serum and glycerine agar, this vigorous growth may occur with some strains of the gonococcus.

The prevailing opinion that the gonococcus does not grow at all on simple media is erroneous and is an uncertain means of differentiation. It is possible by continued culture to adapt many strains to grow on ordinary media.

But—and here is the important clinical observation—original cultures do not grow on ordinary media unless pus or body fluid has been freely transferred with the culture.

In the agglutination test we have a valuable but questionable method of deciding between the gonococcus and the meningococcus.

A meningococcal serum of high value, properly diluted, will agglutinate the meningococcus only, not the gonococcus.

This principle holds with the catarrhalis also, *i.e.*, a powerful meningococcal serum properly diluted will agglutinate the meningococcus but not the catarrhalis, and conversely a powerful catarrhalis serum will agglutinate the catarrhalis but not

the meningococcus. In this latter case however the test is seldom if ever necessary for diagnostic purposes.

A final simple test for deciding between the gonococcus and meningococcus, but unfortunately one which we are prohibited from employing, is that of inoculating the human urethra. Here the gonococcus always produces a typical reaction, the meningococcus produces no result. We must conclude from this that, however closely they resemble each other in staining, morphologic, and cultural characteristics, they are essentially different in their physiology.

In conclusion let me emphasize the clinical bearing of this brief review.

Given a case of blennorrhea the secretion from which contains Gram negative diplococci, what is the first important step? Obviously it is to exclude the gonococcus, for the presence of this organism would influence directly our prognosis and our treatment.

Is the slide diagnosis of any value for this purpose? Yes. It is true it has lost some of its certainty, but this is only relative, and the more laborious laboratory methods should not displace this simpler one any more than the laboratory methods in other departments of medicine should displace the careful clinical examination in which the older members of our profession so greatly excel.

The laboratory should supplement those methods of examination which time and experience have proven valuable and not displace them.

To what degree has the slide examination lost in certainty? In direct proportion to the certainty with which the other members of the Gram negative group are present on the conjunctiva and cause pathological changes there.

The proposition is decidedly different in the case of the urethra. Here Gram negative diplococci other than the gonococcus are not found. The presence of Gram negative diplococci in a blennorrheal urethral discharge may be accepted as certain clinical evidence of the presence of the gonococcus.

Not so in the eye. Here all the Gram negative diplococci occur.

The space already consumed by this paper prohibits entering into a discussion of the frequency with which the various

members of this family are met with on the conjunctiva, or whether or not they are capable of producing a blennorrhea, and if so, of the clinical pictures which the various members of the family present.

I will therefore close by stating a few clinical conclusions.

A purulent conjunctivitis the smears from which show Gram negative diplococci, morphological'y and clinically resembling the gonococcus, should be treated as a gonorrheal ophthalmia. In the presence of a urethral discharge or definite history of infection a definite diagnosis of gonorrheal ophthalmia should be made.

A purulent conjunctivitis, in a person nursing a case of epidemic meningitis or giving a history of possible recent exposure to infection by the meningococcus, the smears from which show Gram negative diplococci, should be treated as a gonorrheal ophthalmia, but the diagnosis withheld until substantiated by cultures.

A mild conjunctivitis, the smears from which show Gram negative diplococci, should be treated as conjunctivitis in general is treated; cultural and laboratory procedures should be at once initiated to establish a definite diagnosis.

The diagnosis of mild gonorrheal infection should not be made without exhaustive cultural and laboratory diagnosis.

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A PRIMARY TUMOR OF THE OPTIC NERVE SUCCESSFULLY REMOVED, WITH PRESERVATION OF THE EYEBALL, BY THE KROENLEIN METHOD.[1]

By Dr. ARNOLD KNAPP, New York

(*With six illustrations on Text-Plates XVIII. and XIX.*)

M. J., aged 9, was brought to the hospital in December, 1914, because of a prominence of the right eye which had been noted for one year and which was slowly increasing. On examination, the right eye is pushed straightforward in the axis of the orbit (Photograph No 1), the motility of the eyeball is normal, palpation reveals no tumor in the orbit, sight is reduced to perception of light in the extreme temporal field. Ophthalmoscopically the disk shows a neuritic atrophy. Examination of the nose is negative. The diagnosis of tumor of the optic nerve is made and an operation advised.

Operation.—December 31, 1914. Under ether the usual incision in the Kroenlein operation along the outer margin of the orbit is made. The bone flap is formed with osteotome and mallet and reflected. A horizontal incision is made in the orbital periosteum and the small finger is carefully introduced. This encounters an elongated swelling continuous with the optic nerve, which extends from the eyeball to the apex of the orbit. The surface of the swelling is smooth and soft. Between the tumor and the eyeball there is a small portion of apparently normal optic nerve. Deep retractors are introduced and the mass is exposed. It is found to be bluish in color. With the finger the tumor is isolated from the surrounding tissues and the optic nerve divided directly behind the eyeball. This part of the tumor is th n grasped with a forceps and the rest of the mass freed and cut through as near the apex of the orbit as possible. During this manipulation a good deal of soft jelly-like tissue is expelled through the cut end of the tumor.

[1] Presented at meeting of Am. Ophth. Soc., July, 1915.

ILLUSTRATING DR. KNAPP'S CASE OF "A PRIMARY TUMOR OF THE OPTIC NERVE"

FIG. 1.—Before operation.

FIG. 2.—After operation.

FIG. 3.—Showing the extent of lateral motility after operation.

There was some hemorrhage. The flap is replaced, deep catgut sutures are introduced, and the skin incision is united with silk. At the close of the operation slight exophthalmus was still present. As this was believed to be due to hemorrhage, the eyelids were sutured together.

During the next twenty-four hours the patient vomited a number of times. The upper lid shows some blood staining. A wet dressing is applied.

January 4th: The swelling has not increased, the skin of the lid is soft, there is no fever, and the patient feels well.

January 5th: The temperature rose to 102° F. The boy complains of some headache. The region about the incision is somewhat swollen. The sutures are removed and the subcutaneous tissue opened into. This was followed by the escape of considerable blood and pus.

January 15th: The infection which seemed to have been localized to the subcutaneous tissue rapidly subsided and the patient is now able to open his eye. The cornea is anæsthetic; the motility of the eye is good, except to the outer side; the pupil is moderately dilated; the optic nerve is white. Retinal vessels as they emerge from the disk are absolutely normal in size. There is no pulsation on pressure of the eyeball. In the region of the macula or perhaps a little beyond the macula there is a whitish area which does not look like œdema but rather more like a deeply situated retinal exudate.

January 25th: The wound is closed; there is still slight swelling of the eyelids; the position of the eye is good; some of the vessels of the retina are distinctly contracted; the whitish area in the macula has disappeared, leaving a few spots. The fundus is otherwise normal.

February 20th: The motility outwards has improved, the pupil is dilated, the vessels are smaller to-day than they have previously been. The optic nerve shows a further stage of neuritic atrophy and the whitish changes in the macula look like connective-tissue changes with some pigmentary deposits in the underlying choroid.

March 10th: The pupil is dilated; motility outwards is better; the inferior blood-vessels are well filled.

June 22d: The position of the eye is normal (Photograph No. 2). There is no swelling of the lids; except for a dilated pupil, the eye looks perfectly normal; motility outwards is completely restored (Photograph No. 3). The retinal vessels are partly normal in size, while some are extremely narrow to the point of obliteration, where they are transformed to white lines. The region of the macula is occupied by an area composed of pigment and atrophy. On the nasal side of the disk there are some areas of slight

choroidal atrophy and some connective-tissue changes in the retina. The optic nerve is completely white. The scar of the incision is a linear one and not noticeable.

The excised part of the optic nerve and tumor consists of an irregular cylindrical-shaped mass *3cm* long by *2cm* wide at its broadest part. The mass is entirely surrounded by a connective-tissue capsule which is the extended dural sheath. Within this sheath at the cut extremities of the tumor a smooth bluish tissue can be seen which is the capsule of the tumor proper. This is presumably the pia. Within this pial sheath there is a swollen, œdematous, bluish-red-looking tissue, with a central defect which at the part of the tumor nearest the apex of the orbit occupies nearly the entire tumor. The tumor is hardened in formol and in Müller's fluid. Paraffin and celloidin sections are made.

Microscopic Appearances.—In the sections of the tumor stained with hematoxylin-eosin, nearest to the eyeball the general structure still resembles the optic nerve. The interseptal spaces are distended, the septa are irregularly hypertrophied, and there is a large increase of the glial elements. This proliferation of the glial tissue is particularly marked along the margin of the spaces where it is continuous with tissue in the sheath (Photograph No. 4). The cells have round or oval nuclei with irregular and indefinite protoplasmic bodies situated in a branching network of fibrillæ. The Weigert stained specimens show irregular and degenerated nerve fibres. Toward the center of the nerve the interseptal spaces become empty and only the connective-tissue trabeculæ with their vessels are present in between a blue-stained amorphous tissue. The blood-vessels are dilated but do not show any change in their walls. The dura is normal. The pia is irregularly thickened, by an infiltration of tissue whose cells vary in different parts. In one place where the central vessels enter the optic nerve, the glia cells are directly continuous with the cells in the pia, where they are crowded together. In other parts the pia is greatly thickened by these invading cells, which are often separated by large clefts in the tissue filled with a blue material.

Proceeding backward from the eyeball, the changes within the neural portion of the optic nerve become more marked and the configuration of the optic nerve is entirely lost. Within the widely distended pial and dural sheaths there is a large cavity which before operation contained the jelly-like material expressed during the operation. The margin of this artificial cavity is formed by proliferating tissue springing from the pia, which is curiously lobulated (see Photograph No. 5). Under the high power this tissue

ILLUSTRATING DR. KNAPP'S CASE OF "A PRIMARY TUMOR OF THE OPTIC NERVE."

FIG. 4.—Section from tumor near eyeball, showing neuroglia proliferation directly continuous with the infiltration of the pia and of the sheath.

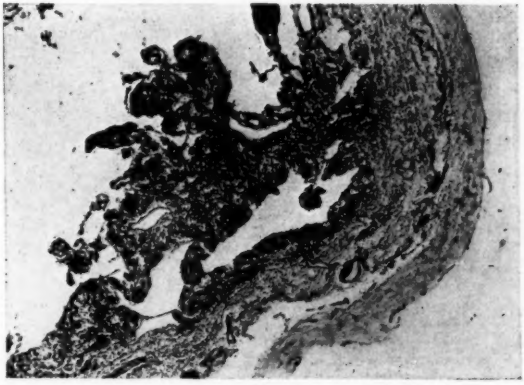


FIG. 5.—Section from tumor near apex of the orbit, showing the lobular condition of the tumor springing from the internal surface of the pia, the central cavity formerly containing a myxomatous-like tissue.

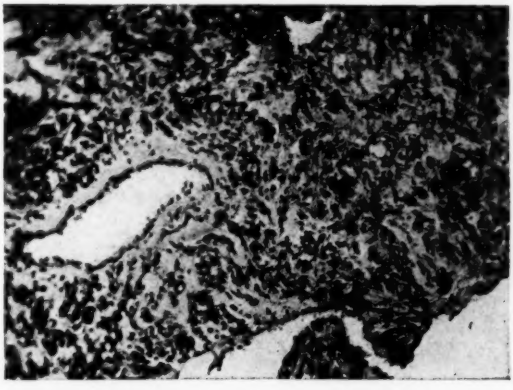


FIG. 6.—High power of this portion of the tumor.

is very cellular, the nuclei are round or oval, the cell bodies can not be identified except for an occasional fusiform or branching tendency; they are separated by vacuoles and cystic spaces and replaced by a substance which stains blue. The great vascularity of this tissue is very striking and suggests a hemangioma; the vessel-walls show no degenerative changes.

Under "Tumors Arising in Tissues Derived from the Mesoblast," Collins and Mayou (in *Pathology and Bacteriology of the Eye*) describe the new growths of the optic nerve as follows. These are most frequently neurofibromata. In some tumors there is an overgrowth of all of the connective-tissue constituents, a general fibromatosis. In others, some parts are exclusively affected. Thus the growth may be entirely in the nerve itself starting from the neuroglia and fibrous trabeculæ without involving the sheaths. Not uncommonly the pial sheath and the fibrous tissue are affected and the dura escapes. The new growth is composed of fibrous tissue, either fully formed or of an embryonic type. Cystic spaces containing fluid may form within the growth. The fluid has not been found to contain mucin, and there does not appear to be any real evidence of myxomatous degeneration.

Parsons (*Pathology of the Eye*) regards these tumors as belonging to the endotheliomas, and believes that the neuroglial proliferation is a subsidiary phenomenon.

A. C. Hudson (*Ophthalmic Hospital Reports*, vol. 18, 1910) gives an exhaustive review of 118 primary tumors of the optic nerve from their clinical and pathological sides. He agrees with Fischer in designating those tumors as examples of gliomatous degeneration and suggests the following modification, "degenerative gliomatosis implying a generalized overgrowth of neuroglial tissue of infiltrative character dependent upon some degenerative change in the tissues of unknown origin."

Our tumor shows a general neuroglial proliferation with myxomatous-like degeneration, though the main seat of the process seems to be in the pia. A transition of the two parts of the tumor can be made out. The specific neuroglia stain unfortunately did not succeed, owing to improper fixation of the specimen.

The clinical features of this case do not differ from those generally found in this well-defined group of tumors.

The operative procedure, the Kroenlein osteoplastic resection of the outer bony wall of the orbit, proved perfectly satisfactory as it furnished free access to the site of the tumor and permitted the preservation of a normally appearing eye without any subsequent disturbance of motility.

An interesting feature in the course after removal of these optic-nerve tumors, is the changes in the retinal circulation which occur. In our case it was very remarkable that notwithstanding complete division of the optic nerve, and its blood-vessels, the retinal circulation apparently was unaffected, the vessels being for at least three weeks of normal size, both the arteries and the veins, except that pressure exerted upon the eyeball elicited no pulsation. Subsequently some of the vessels became narrow and obliterated. The inferior temporal vessels, however, are at the present date still of perfectly normal size.

Schlodtmann, in his monograph on the "Extirpation of Retrobulbar Tumors," published in Vossius' *Sammlung Zwangloser Abhandlungen*, 1900, has given this feature particular attention, and shows that the changes in the ophthalmoscopic picture of the retinal circulation after operation depend upon whether a collateral circulation has been established or not. It is evident that a tumor obliterating the optic nerve will interfere with the central retinal vessels. Under these circumstances a collateral circulation from the posterior ciliary blood-vessels and the retina must take place and, as the latter vessels may partly or completely escape obliteration through the operation, the subsequent circulation of the retina will be carried on by these vessels. If this collateral circulation has been developed, no evidences of an arrest of the retinal circulation (ischæmia, œdema of the retina) occur. The pigmentation and atrophies which are observed in the eye-ground are presumably the evidences of a disordered circulation.

A point to which I want to draw particular emphasis is the incomplete removal of these optic-nerve tumors which, according to Hudson, occurs in 50 %. Thus, in the case just described, the tumor process was not limited to the apex of the

orbit, and unquestionably has extended into the cranial portion of the optic nerve. At present there are no signs, however, of any intracranial extension. In the cases on record not a single instance of local recurrence in the orbit has been noted.

These tumors are generally regarded as almost benign. It seems to me that Byers is correct in warning against this assumption, even if it is years before the intracranial extension shows itself. As the X-ray seems to possess a distinct effect on the growth of gliomatous tissue (see Axenfeld, *Klin. Monats. f. Augenhlk.*, 1915, No. 1), should not systematic treatment with the X-ray constitute a part of the treatment of these cases?

A CASE OF CYCLICAL THIRD-NERVE PARALYSIS.

By Dr. G. GROETHUYSEN, University Eye Clinic, Munich.

Translated from the *Arch. f. Augenhlk.*, Vol. LXXVI., No. 3–4, 1914.

(*With two half-tone illustrations in the text.*)

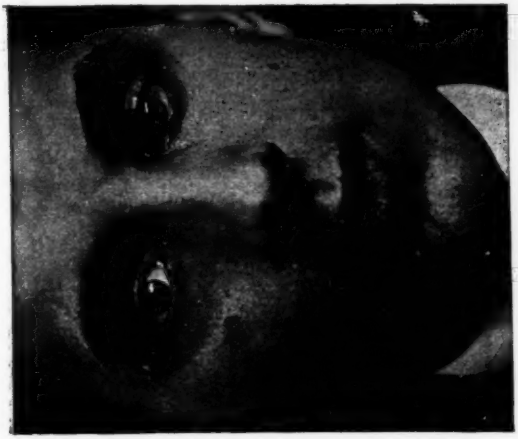
THIS case is interesting on account of the way in which the various phases of the oculomotor-nerve paralysis could be influenced.

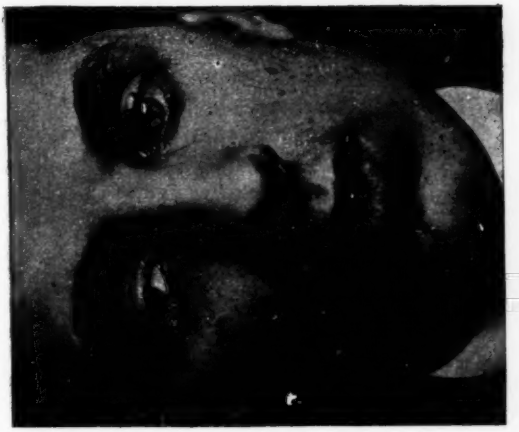
F. X. P., aged 18, a baker, came to the clinic in order to have an operation performed on his right eye which at times he was not able to open. This condition has existed since birth. The previous history and his family history are negative. The patient is well nourished and mentally normal. The nervous system, beyond the oculomotor-nerve paralysis, shows no abnormalities. Reflexes are normal. Romberg is negative.

The periodic variations in the right eye are as follows:

In the condition of paralysis the palpebral fissure is 5*mm* wide. The eyeball is slightly abducted and is somewhat turned down. Pupil is 8*mm* wide and immobile; there is no reaction on sensory stimuli. The refraction of the eye shows H. as of 3½ D., 30° nasal. Eye-ground normal. S=0.1, improved with glasses to 0.2. After about 15 seconds of this paralytic state, the eyelid shows three or four spasmodic contractions, then it is slowly raised so that the palpebral opening is as large as on the healthy side. The eyeball at the same time is adducted and rotated through the action of the superior oblique. The pupil contracts to 4*mm*. This transition to the state of spasm lasts from about four to five seconds. During this spasmodic state with the eyes directed straight forward no change can be observed except for a narrow pupil on the diseased side. The pupil is then absolutely immobile. Skiascopically the refraction has changed to a myopic astigmatism. The axis is now 15° nasally; vision reduced to counting fingers in 2¾*m*. With

glasses it is improved to 0.2. This condition lasts twenty seconds. Then a number of small contractions are observed in the upper lid; the lid falls; the pupil becomes wide, and





after seven to eight seconds the condition of paralysis is again present.

The eye can be abducted to its normal extent; the

adduction is only a little beyond the middle line. On looking up, the eyeball rotates in the sense of the superior oblique.

Eserin contracts the pupil to 1.8 or 2.5*mm* without arresting the above-mentioned variations. At the beginning with each contraction the patient experiences pain in the upper part of his eyeball, which continues for one half hour. Atropin dilates the pupil to a maximum of 9*mm*. Increased frequency of pulse (150) does not influence the duration of these attacks. During sleep the duration of this paralytic condition lengthens three times on the average, namely, from fifty-five to sixty seconds.

The transition to the spasmodic condition takes place with a number of contractions. The palpebral fissure is permanently opened and measures between 2 and 6*mm*. The cornea always remains visible. The left eye shows no changes beyond a slight myopic astigmatism. The pupil reacts directly and consensually. The individual phases can be influenced as follows:

The state of spasm can be lengthened on asking the patient to close his healthy eye and at the same time making him fix with his affected eye an object held at a distance of 15*cm*. This repeatedly produced periods of spasms of fifty seconds in duration. The consecutive state of paralysis could not be lengthened. At the same time, this state could be interrupted at will every four seconds, and transformed into a spasm, if the patient was forced to intently fix an object near the affected eye. The transition took place without spasms slowly and uniformly. On removing the object which the eye was fixing, the state of paralysis recurred and remained for the usual length of time. Both symptoms appeared to a less extent when the patient was asked to turn his eye as far as possible to the left, which produced the greatest degree of adduction in the affected eye. A moderate lengthening of the paralytic condition was obtained on a maximal turning of the eye to the right, during which an interruption of the spasmodic condition was not observed. The period in which the phenomenon was prolonged by forcibly turning the eye to the right or to the left was from five to ten seconds.

This case differs from those previously described by the marked ways in which the various phases could be influenced. This tendency suggests that the cause of cyclic oculomotor-nerve paralysis is a cortical process.

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REPORT OF THE TRANSACTIONS OF THE SECTION ON OPHTHALMOLOGY OF THE ROYAL SOCIETY OF MEDICINE.

By Mr. C. DEVEREUX MARSHALL, F.R.C.S., London.

An ordinary meeting of the Section was held on Wednesday, June 9th, under the presidency of Mr. Priestley Smith, F.R.C.S., of Birmingham.

Mr. A. C. Hudson showed a case of **sympathetic ophthalmitis treated by salvarsan and neo-salvarsan.** It was regarded as an undoubted case of the condition, and seemed a genuine cure.

Mr. J. S. Hosford exhibited two cases of the **albuminuric retinitis of pregnancy**; Dr. Attlee, **coloboma of the iris in mother and child;** Mr. Charles Wray, a case of **bony growth in the frontal sinus.** In cases of retrobulbar neuritis suspected to be of sphenoidal origin, he advocated making the patient spend some time with the face downwards, with a view to facilitating drainage from the sphenoidal and posterior ethmoidal cells. Mr. W. T. Holmes Spicer discussed the case.

Mr. J. Herbert Fisher read a paper on **retinitis of pregnancy.** He had not included in the title the term "albuminuric," as he wished to lead his hearers away from the idea that the acute retinal changes were the results of the kidney disorder. Obstetricians now no longer explained the albuminuria of pregnancy as the result of obscure reflex effects of the gravid uterus upon the kidneys, or by mechanical pressure on the ureters. They attributed it, with eclampsia and pathological vomiting of pregnancy, to toxæmic products in the circulation. Eclampsia could not be predicated by any examination of the urine; the effects were especially seen in the quality of the blood and in the blood-vessel walls. In

fatal cases of eclampsia, hemorrhages of brain and necrotic changes in the liver were often found, and albuminuria was an effect of the disease on the kidney, not the cause. In the retinitis of pregnancy, the condition of retina was different from that in albuminuric retinitis; as also was its sequel. Syncytio-toxins—products of the disintegration of the syncytium cells—had been found in these cases; and these cells immediately connected the fetal with the maternal structures. The author proceeded to give particulars of a series of typical cases of the condition which had been under his care. In one fatal case, Mr. A. C. Hudson made a pathological examination on the day after death, and found the coats of the eye *in situ*. There was some œdema of the nerve head, and in the nasal quadrant of the retina were two large hemorrhages. The microscope showed the sclera and nerve sheaths to be normal, the chief pathological changes being in the large choroidal arteries, many of which showed gross endarteritis, causing, in some instances, obliteration of the vessel lumen. Some of the choroidal arteries were normal. Similar pathological changes were found in sections of posterior ciliary arteries surrounding the optic nerve behind the eyeball. Bruch's membrane was everywhere intact, and the retinal pigment normal. The retina and optic nerve head showed evidence of œdema, in the former almost limited to the internuclear layer. Rods and cones were almost entirely absent, but this may be attributable to post-mortem changes. In the large retinal veins there was pronounced thickening of the adventitial coat. He had found it difficult to group his cases. The rule had been for good recovery of vision to ensue, with the disappearance of all acute manifestations in the retina, thus differing absolutely from cases of ordinary renal retinitis. In cases in which defects of vision were permanent, this seemed to have been because changes had been produced in the walls of the arteries, or an atrophic condition of the nerve. A recurrence of the retinitis was not necessarily seen when subsequent pregnancies occurred, even though the albumen did not quite disappear in all. One of his cases died, after an interval of six years, from cardiac failure; another, after eight and a half years, of cerebral hemorrhage into the left corpus striatum. In this case the kidneys were found to be of the typical red granular type. It

seemed clear, from his cases, that albuminuria of pregnancy was not sufficient, alone, to set up the typical retinitis of pregnancy.

In the ensuing discussion, Mr. J. S. HOSFORD reported having carefully observed sixteen cases during the last fifteen years; only three of them were now alive. All but two ultimately developed a star-shaped spot on the macula, a sign which he regarded as of fatal omen. Many patients seemed to quite recover from the initial attack, but later had a relapse. In a series of 132 cases seen in Dr. Fenwick's wards, 81 were in females, 51 in males; the onset among single men and single women seemed to be about equal. Much of the renal trouble seen fairly late in life might have started, in females, in pregnancy. Only three of the 132 cases had myopic eyes. Since the Wassermann reaction was introduced, he had had all the cases he saw so tested, but none was syphilitic.

Mr. W. C. ROCKLIFFE related a case in which **retinitis occurred in the first pregnancy,** but the defect of sight seemed to be quite recovered from after premature labor was induced. A subsequent pregnancy brought on a repetition, but though labor was again ended prematurely, sight became progressively worse, and ended in blindness. The patient died, four years later, from heart failure.

M. J. B. LAWFORD alluded to the far-reaching effect of the toxæmia. In some of the author's cases, although there was no recrudescence of retinal change during subsequent pregnancies, yet toxic effects showed themselves at a later date, and eventuated fatally. It was a common belief that one of the safeguards in this condition was the avoidance of further pregnancies in the patient. In one case which he had under care over twenty years ago, the lady developed retinitis in her first pregnancy, and had great defect of sight. This disappeared after delivery, and, acting on the advice of her doctor and himself, she had no further pregnancies. Her sight remained good for a number of years, but ultimately she developed advanced changes in the retinal vessels, and succumbed to chronic nephritis. Another patient, older, developed the condition in her third pregnancy, and recovered. The advice to bear no more children was disregarded, and in her next pregnancy there was a great aggravation of her toxæmic con-

dition, and she died of nephritis. He asked whether obstetricians were aware of the reason for the persistence of the toxic effects of the first attack, even though some subsequent pregnancies did not seem to be accompanied by the symptoms. There seemed to be need for a revision of the view as to the comparative innocuousness of the retinitis of pregnancy.

Mr. LESLIE PATON regarded the paper as important as giving a broad view of a disease not apparently due to a microbial poison, but to a cyto-toxin; and he tentatively suggested that such conditions as the iridocyclitis seen in women at the period of the climacteric would possibly be brought into the same category. The seriousness of the disease seemed to be directly proportional to the extent to which the vessels were injured at the time of the attack. One case, though presenting "silver-wire" arteries, remained still well, eight years after the attack. He was much interested in the statement of the author that subsequent pregnancies need not necessarily cause a recurrence of the retinitis, for it touched a matter on which advice was frequently asked.

Mr. FISHER replied, suggesting combined investigation by obstetricians and ophthalmologists concerning the diseases attributable to the toxæmia present in pregnancy.

QUARTERLY REVIEW OF THE PROGRESS OF OPHTHALMOLOGY.

By H. KOELLNER, Berlin; W. KRAUSS, Marburg; R. KÜMMELL, Erlangen; W. LOEHLEIN, Greifswald; H. MEYER, Brandenburg; W. NICOLAI, Berlin; H. PAGENSTECHER, Strassburg; K. WESSELY, Würzburg; and M. WOLFRUM, Leipsic, with the Assistance of Drs. ALLING, New Haven; CALDERARO, Rome; CAUSÉ, Mayence; CURRAN, Kansas City; DANIS, Brussels; GILBERT, Munich; GROENHOLM, Helsingfors; v. POPPEN, Petrograd; TREUTLER, Dresden; and VISSER, Amsterdam.

Edited by MATTHIAS LANCKTON FOSTER, M.D., F.A.C.S., New Rochelle, N. Y.

FIRST QUARTER, 1915.

I.—RELATIONS OF OPHTHALMIC TO GENERAL DISEASES, INCLUDING POISONS.

1. BATTEN. **Family cerebral degeneration with macular change.** *Quarterly Journal of Medicine*, July, 1914.

2. HIRSCHEL, G. **The cure of obstinate trigeminal neuralgia by injection of alcohol into the Gasserian ganglion.** *Muenchener med. Wochenschrift*, 1915, p. 5.

3. ROY, DUNBAR. **Acute mania following the use of atropine solution in the eyes.** *Southern Medical Journal*, December, 1914.

4. SPILLER, WILLIAM G. **The pathology of tabetic ocular palsy with remarks on the relation of syphilis to the so-called parasyphilitic diseases.** *Journal of Nervous and Mental Disease*, January, 1915.

5. STEPHENSON. **The ocular manifestations of infantile scurvy.** *Ophthalmoscope*, March, 1915.

6. TAYLOR, G. H. **Color sense in relation to nervous stammer.** *Ibid.*, February, 1915.

7. UHTHOFF, W. **Contribution to the visual troubles caused by methyl alcohol poisoning.** *Klin. Monatsbl. f. Augenheilkunde*, January, 1915, p. 48.

8. WESTMACOTT. **Ocular paralysis of otitic origin.** *Lancet*, November 14, 1914.

BATTEN (1, **Family cerebral degeneration with macular change**) reports three children in a family of five, who were

affected with a progressive disease leading to dementia, blindness, and paralysis, one of whom showed macular changes. The children developed in a normal manner until three and one half years of age; epileptic fits then occurred and they began to degenerate. All three died. In one, diffuse degenerative changes were found affecting the ganglion cells in the cerebrum, cerebellum, and spinal cord.

CURRAN.

STEPHENSON (5, **The ocular manifestations of infantile scurvy**) in giving an interesting review of the ocular manifestations of scorbutus reports a case showing ocular signs which preceded the other manifestations of scorbutus. Rapid improvement took place under antiscorbutic treatment.

CURRAN.

SPILLER (4, **The pathology of tabetic ocular palsy with remarks on the relation of syphilis to the so-called parasyphilitic diseases**) says that a difference of opinion exists as to the nuclear or nerve origin of tabetic ocular palsies and a distinction is made by some in the pathology of the ocular palsies of tabes and brain syphilis. It would seem from the study of the following case of complete bilateral tabetic ophthalmoplegia that this distinction is unreliable and that in this as well as in other respects the sharp limitation formerly made of parasyphilis and cerebrospinal syphilis needs much modification.

The patient, J. F., contracted syphilis in 1895. In 1911, double ptosis developed together with general symptoms of tabes. In 1913, admitted to hospital. The examination of the eye showed a total internal and external ophthalmoplegia of both eyes with paralytic divergence. The iridic reaction was lost and the optic nerves were partially degenerated. The patient died two weeks later.

At the autopsy much lymphocytic infiltration was found in the pia of the spinal cord and base of the brain and the basilar artery presented much endarteritis. The posterior lumbar roots and the posterior columns of the cord were degenerated in the usual manner of tabes.

The ocular nerves were cut separately from the brain. Each oculomotor nerve showed much lymphocytic infiltration and this infiltration was more intense in the left nerve. These

nerves were much and equally degenerated, and the degeneration was greater than that of the abducens and trochlear nerves. The oculomotor nuclei were greatly atrophied and contained few nerve cells, and the oculomotor fibers within the cerebral peduncles were much fewer than normal. Patches of rarefied tissue containing few nerve fibers were found within the oculomotor nuclei. The Edinger-Westphal nuclei were much better preserved than the other portions of the oculomotor nuclei.

The trochlear nerves showed slight lymphocytic infiltration.

The left abducens nucleus was considerably more atrophied than the right, although the right nucleus was much affected. The abducens nerves were much atrophied, the left more so than the right. Both these nerves presented considerable lymphocytic infiltration, and the left more than the right.

The degeneration of the oculomotor nerves was so far advanced that it was impossible to decide whether the degeneration began in the nerve or in the nucleus, but the findings in the abducens nerves were of importance in this respect. The left nucleus and nerve were considerably more degenerated than the right, and the lymphocytic infiltration of the left nerve at its exit from the upper medulla oblongata was greater than that of the right. This would seem to indicate that the syphilitic process was primarily in the nerve rather than the nucleus, and would make a distinction between the ocular palsies of tabes and syphilis unreliable. This case clinically was distinctly one of tabes, and the pathological findings in the cord were those of tabes. GROUT.

ROY (3, **Acute mania following the use of atropine solution in the eyes**) reports that in 10,000 refractive cases in his practice, twenty of these showed marked symptoms of atropine intoxication when this drug was used for refractive purposes. One case of iridochoroiditis, which was in the hospital for treatment, developed mental hallucinations which subsided only on the discontinuance of the drops and sedative treatment. Recovery was normal and the neurological examination showed no cause for the mental disturbance.

GROUT.

HIRSCHEL (2, **Cure of obstinate trigeminal neuralgia by injections of alcohol into the Gasserian ganglion**) has had

brilliant results in several cases of neuralgia that had existed for a number of years and had resisted both internal and operative treatment. He injects first a few drops of a 2% solution of novocain and then from ½ to 1 *ccm* of 70% alcohol. Anæsthesia or hypæsthesia comes on at once, the corneal reflex is lost or greatly reduced, but usually returns after a number of hours; he has never observed a permanent loss. No recurrences have occurred as yet in the patients, after a lapse of at most a year and a half.

No other poison is so elective in its effects upon the optic nerve and retina as methyl alcohol. The changes found are in the ganglion cell layer of the retina. UHTHOFF (7, **Visual troubles caused by methyl alcohol**) found that of 200 men who drank methyl alcohol 50 showed signs of serious intoxication. Twelve died before any observations were made concerning their vision. Of the remaining 38, serious impairment or blindness occurred in two, less impairment with small relative central scotomata in six, and subjective troubles with normal ophthalmoscopic condition in nearly all the rest. Pain on moving the eye occurred once. No paralyses of ocular muscles were observed. The course in the two worst cases was typical.

TAYLOR (6, **Color sense in relation to nervous stammer**) says that out of sixty thousand cases examined for railway service, eighteen per cent. had nervous stammer sufficient to impair their usefulness as railway servants; and in none of these cases was there any red-green blindness. In one case, however, the candidate who had a nervous stammer named pale green "white." He considers it probable that a nervous stammer is much rarer in color-blind than in color-normal persons.

CURRAN.

WESTMACOTT (8, **Ocular paralysis of otitic origin**) in an excellent paper on this subject says that otogenic paralysis of the oculomotor and other orbital nerves is clearly established, but he thinks it is difficult to establish the pathological lesion present. If paralysis occurs with ipso-lateral otorrhœa, with headache and vomiting, the auditory apparatus should be explored, and also the nasal sinuses.

CURRAN.

II.—GENERAL AND EXPERIMENTAL PATHOLOGY AND TREATMENT.

9. BADER. **The subconjunctival injections of inorganic salts and the dissociation theory.** *Zeitschrift f. Augenheilkunde*, March–April, p. 155.

10. ELLIOT. **A tumor of the eye presenting unusual features.** *Ophthalmoscope*, February, 1915.

11. SZILY. **Anaphylaxis in inflammations of the eye.** *Klin. Monatsbl. f. Augenheilkunde*, January, 1915, p. 1.

12. WEIDLER, W. B. **Intraocular sarcoma. With report of a case of spontaneous rupture of the globe.** *Annals of Ophthalmology*, January, 1915.

Spontaneous rupture in sarcoma is of rare occurrence and probably generally due not to increase in the size of the tumor but to sudden rupture of an intraocular blood-vessel as in the case reported by WEIDLER (12, **Intraocular sarcoma**). The usual point of rupture is the cornea.

ALLING.

ELLIOT (10, **A tumor of the eye presenting unusual features**) describes an unusual tumor which apparently began in the eyeball over nine years previously. When removed, it was egg-shaped and measured 119*mm* from before backward. It resembled a large multilobular cyst with contents of varying consistence. The walls consisted of hypertrophied sclerotic and cornea. The deeper structure was fibrillar, forming a sponge work, the meshes of which contained a homogeneous substance. The fibrils were branching processes of large multipolar cells which strongly suggested nerve tissue or altered neuroglia.

CURRAN.

SZILY (11, **Anaphylaxis in inflammations of the eye**) considers that the local anaphylactic inflammations of the eye possess a great theoretical and practical interest for human pathology. In the course of various diseases of the eye conditions are frequently present that favor the origin of an inflammatory anaphylactic poison. Such sources are: (1) The component of the anaphylatoxin from the specific microorganism which excites inflammation; (2) the anaphylactic poison generated by the action of the body juice upon homogeneous tissues. With the great multiplicity of possibilities for the generation of inflammatory anaphylatoxins, especially as there is no specificity in their action, it is for the present

impossible to pretend that anaphylactic processes are the primary causes of certain typical eye diseases. The preliminary theory of a primarily acting poison for the generation of anaphylaxis is unavoidable under any circumstances. The theory of non-specific transmission of irritation, whereby a specific or non-specific sensitivation of one eye causes in the other a condition of increased sensitiveness, lacks an exact experimental foundation. The importance of anaphylaxis in ophthalmology lies in the fact that we have learned to recognize in it a new possibility for the explanation of inflammatory processes in the eye where the immediate action of localized germs or of their toxins could not furnish one.

BADER (9, **Subconjunctival injections of inorganic salts**) finds the explanation of the effects of subconjunctival injections of inorganic salt solutions in the theory of electrolytic dissociation, which depends on the diffusion and osmosis induced by the salt, and the kations and anions induced by the ions. Subconjunctival injections of neutral potassium salts, such as 0.5 to 1*ccm* of a 2.55% KCl, a 3.95% KNO_3, and a 5.21% K_2SO_4 solution, cause no harm to a rabbit's eye. On the contrary, isotonic neutral sodium solutions cause distinct symptoms of irritation in the eye, slight blepharospasm, injection of the globe, and a hyperæmia of the iris that causes a contraction of the pupil which lasts from fifteen to thirty minutes. These symptoms usually pass away within twenty-four hours. Daily injections of these doses cause no signs of poisoning in rabbits. Subconjunctival injections of potassium accelerate, like those of common salt, the absorption of india ink from the anterior chamber in rabbits' eyes, but more rapidly at first. The mentioned doses of the neutral potassium salts cause a considerable increase of the albumin in the aqueous, from ten to fourteen times greater than is produced by corresponding isotonic solutions of sodium. In subconjunctival injections of hypertonic neutral solutions of sodium salts the action of the salt predominates, while in those of neutral potassium salt solutions the effect of the ions prevails. With the sodium salts an irritant effect of the anions comes into play, least with the hydrochlorates, most with the sulphates. The chief action of the potassium salts is due to its kation, the potassium. The effects of corresponding sodium and potassium

solutions upon freshly dead eyes of pigs and rabbits showed differences in strength that were the same, only less marked than those found in the eyes of living rabbits.

III.—METHODS OF RESEARCH, REMEDIES, INSTRUMENTS, GENERAL OPERATIVE TECHNIQUE.

13. GREEN, A. S. **A new eye speculum.** *Ophthalmic Record*, February, 1915.

14. HOLTH. **Open spectacles or closed goggles as a protection against snow-blindness.** *Ophthalmoscope*, February, 1915.

15. REITSCH. **A pocket skiascope that may be used at the same time for subjective testing for glasses.** *Zeitschr. f. Augenheilkunde*, January, p. 34.

16. SPELEERS. **Emplacement of balls of paraffine after enucleation and evisceration of the eye.** *Nederl. Tijdschr. voor Geneesk*, 1914, ii., No. 1.

17. STIEREN, EDW. **Salvarsan in ophthalmology.** *Ophthal. Record*, January, 1915.

18. TAYLOR, G. H. **Results of examination of 500 consecutive cases with Stilling's plates.** *Ophthalmology*, January, 1915.

There is still some doubt regarding the effect of salvarsan on the optic and motor nerves. STIEREN (17, **Salvarsan in ophthalmology**) has observed a number of cases of optic neuritis which seemed to improve more rapidly under this treatment than in the past with mercury but with more secondary atrophy. He believes that it promotes primary atrophy if it has already begun. He thinks that the Swift-Ellis technique is more likely to be harmless.

ALLING.

GREEN (13, **A new eye speculum**) has devised a speculum which has the two bars holding the lid plates attached to a handle so that an assistant can control the lids and hold them away from the eyeball, hence lessening the danger arising from contraction of the orbicularis.

ALLING.

HOLTH (14, **Open spectacles or closed goggles as a protection against snow-blindness**) lays down the following rules for protection against snow-blindness in Arctic, Antarctic, and sporting expeditions:

I. All more or less hermetical arrangements of goggles for the exclusion of side lights are superfluous and serve only to moisten the glasses.

II. The best frame is the common open spectacle frame, which should be fitted with large, mussel-shaped "Euphos" glasses. CURRAN.

REITSCH (15, **A pocket skiascope**) has devised an instrument consisting of two disks, one containing convex, the other concave glasses, and two disks containing cylindrical glasses for use in astigmatism. The instrument is used at the distance of half a meter. After using the glasses for the objective determination of the refraction they may be used for the subjective fitting of glasses.

The report of TAYLOR (18, **Examination with Stilling's plates**) is interesting as showing the percentage of color defects in eyes otherwise normal.

Cases	Stilling's Plates	Holmgren Wool	Williams Lantern
466	+	+	+
17	—	—	—
9	—	+	—
3	+	—	—
5	+	+	—

Rejections by the regular tests were:

Red blind	13—2.6%
Incomplete	3—0.6%
Feeble	4—0.8%
Lantern only	14—2.8%
	34—6.8%

ALLING.

SPELEERS (16, **Paraffine balls**) speaks highly of the cosmetic effect produced by using balls of paraffine at a melting point of 60° for insertion after enucleation or evisceration of the eye. (The method is well known in this country.) VISSER.

IV.—ANATOMY, EMBRYOLOGY, MALFORMATIONS.

19. COATS. **Hernia and rupture of the early lens vesicle.** *Royal Ophthalmic Hospital Reports*, xviii., part 2.

20. THOMSON. **The heredity of microphthalmos with and without cataract.** *Klinische Monatsblaetter f. Augenheilkunde*, liv., p. 236.

COATS (19, **Hernia and rupture of the early lens vesicle**) found in a four weeks' human embryo the epithelium of the

left lens vesicle evaginated backward, forming a cavity. The lens vesicle was open at the surface, the epithelium and basement membrane well formed. The central cells of the lens vesicle degenerated and fell backward and gave the appearance of Morgagnian globules. The primary optic vesicle was not yet closed. In the right eye there was a rupture of the lens vesicle but not any hernia, the vesicle being almost closed. Coats says that this supports the statement of Collins that protrusion at the posterior pole may occur apart from the swelling of lens fibers and traction by the hyaloid vessels and the mesenchyma. The case also suggests that discoid cataract, etc., may be due to disease of cells in the early embryo.

CURRAN.

THOMSON (20, **Heredity of microphthalmos**) tells us of a family in which microphthalmos and lamellar cataract were hereditary. Both anomalies were present in three members of the family, while lamellar cataract alone was present in the father and another child. The grandparents were related.

V.—NUTRITION AND INTRAOCULAR TENSION.

21. BEHR. **The parenchymatous current in the optic nerve and retina.** *Archiv f. Ophthalmologie*, lxxxix., p. 265.

22. LOEWENSTEIN and KUBIK. **Refractometric studies of the aqueous.** *Ibid.*, p. 197.

As the result of his experiments BEHR (21, **Parenchymatous current in the optic nerve and retina**) believes that there are two fairly independent systems of fluid spaces in the optic nerve and retina, the parenchymatous and the circumvascular. He deals mainly with the former. The glia fibers serve chiefly for the parenchymatous current, and where they are most abundant, as beneath the pia and septa, the current is best. The interior of the bundles of nerve fibers may be injected and here also the fluid follows the individual glia fibers. These fluid spaces extend into the layer of nerve fibers of the retina. In the orbital portion of the optic nerve they are completely shut off from the intermediate space of the sheath. The circumvascular lymph spaces of the optic nerve are generally isolated and possess at the oblique entrance of the central vessels a broad communication with the parenchymatous spaces. The move-

ment of fluid is likewise completely separate in the bundles of fibers in the nerve. It is only within the cavity of the skull that they pass out of the nerve through the pial sheath and empty freely into the subarachnoidal space and at the angle of the chiasm directly into the recess of the third ventricle. The current is directed centrally in the optic nerve.

LOEWENSTEIN and KUBIK (22, **Refractometric studies of the aqueous**) have sought to answer the question whether the composition of the aqueous is constant by an investigation of its refractive index. They find it to be constant in normal rabbits when special precautions are observed. Prolonged instillation of cocaine and brief luxations of the eyeball exert no influence. Calomel and mechanical irritation with sand were likewise ineffective, but six hours after an insufflation of dionin there was a distinct increase of the index. Subconjunctival injections of equimolecular solutions of some salts changed the refractive index in various ways. The injection of air or of distilled water caused a moderate elevation of the refractive index. Bandaging the eye led not only to hypotony, but also to a high degree of elevation of the index. Hot compresses of from thirty to fifty-five minutes' duration and congestive hyperæmia proved very efficient, while the results obtained with diathermia were of less importance.

VI.—THE SENSE OF SIGHT.

23. BLASKOVICZ. **The visual unit.** *Klin. Monatsbl. f. Augenh.*, liii., p. 552.

24. DOYNE, R. W. **"Eye" in sport.** *Ophthalmoscope*, January, February, and March.

25. SCHROECK. **Congenital word blindness.** *Klin. Monatsbl. f. Augenh.*, liv., p. 167.

26. STRAUB, M. **New optotypes for the scientific determination of the vision.** *Nederl. Tijdschr. voor Geneesk*, 1914, ii., No. 12.

STRAUB (26, **New optotypes**) thinks that for daily practice Snellen's test-types are still to be preferred, but for scientific investigations they are insufficient. The double point is the only correct physiological test. A single eye can take into account only two dimensions in the determination of the sense of form. This fixes the direction of the object in space, and it would therefore be more correct to speak of it as the sense of

direction rather than of form. For the perception of minimal differences in direction short rods suffice, which may be conceived as the blending of two points. Square points having the same surface may be placed between the rods for control. Figures may be made from these rods according to Snellen's model. VISSER.

BLASKOVICZ (23, **The visual unit**) suggests as the visual units which he denominates oxyoptrie, the point at which the angle of vision has a minimum separabile of one degree, which is about the same as counting fingers at one metér. The vision would then be expressed not in fractions, but in whole numbers or oxyoptries. Thus a vision of 0.5 would be expressed as V = 30.

Nearly all of the observations of congenital word blindness have been made by English writers, to which SCHROECK (25, **Congenital word blindness**) adds five cases, four girls and one boy, in whom the peculiar faults were more or less marked. Almost all observations have been made by ophthalmologists because faulty eyes were originally suspected. He considers that such cases are more common than has been thought, and that they are of particularly great interest to teachers.

DOYNE (24, **" Eye " in sport**) discusses and analyzes the part the eye takes in the various sports. He points out the importance of coördination of extrinsic muscles of the eye in judgment of direction and distance, etc.; and admirably discusses the psychical elements in formation of judgment of position. The trend of his argument is that the good sport depends more on the coördination of both eyes than on the possession of a "master eye."

This is a very interesting paper, showing deep thought and careful preparation, and, to be appreciated, it must be read in full as it does not lend itself well to abstraction.

CURRAN.

VII.—REFRACTION AND ACCOMMODATION.

27. HARCOURT. **Fits due to uncorrected errors of refraction.** *Liverpool Medico-Chirurgical Journal*, January, 1915.

28. ROENNE. **Transitory hypermetropia in diabetes.** *Klin. Monatsbl. f. Augenheilkunde*, liv., p. 207.

ROENNE (28, **Transitory hypermetropia in diabetes**) reports a case of this nature and presents the following explanation.

Diabetes induces successive changes in the chemical conditions in the lenticular substance that cause a latent tension of the fibers. When this tension reaches a certain point the force that gives form to the lens is overcome and a change of refraction suddenly appears. The fact that this disturbance appears only in elderly individuals seems to show that a certain consistency of the lens is best fitted for its appearance.

HARCOURT (27, **Fits due to uncorrected errors of refraction**) reports a case of a youth of nineteen years who developed epileptic fits after close study. He had as many as twenty-two a day at times. The condition was apparently cured by the correct glasses and has remained so for over two years.

CURRAN.

VIII.—THE MOTOR APPARATUS OF THE EYE.

29. DORFF. **Latent nystagmus.** *Klin. Monatsbl. f. Augenh.*, liii., p. 503.

30. EWING, A. E. **Abducens palsy following nasal trauma and nasal infection.** *American Journal of Ophthalmology*, December, 1914.

31. GERTZ. **The gliding or slow movement of the eyes.** *Zeitschrift f. Sinnesphysiologie*, xlix., p. 29.

32. HENRY, JOHN P. **Ophthalmoplegia interna caused by exposure to ultra-violet rays.** *Ophthalmoscope*, April, 1915.

33. LUETTGE. **The anatomical condition in an associated lateral paralysis.** *Aerztl. Verein Hamburg*, June 9, 1914.

34. NICCOL. **A pedigree of hereditary nystagmus.** *Ophthalmoscope*, May, 1915.

35. REBER, W. **The influence of heredity in the development of strabismus.** *Ophthalmic Record*, February, 1915.

36. WILLARD, L. M. **Two cases of exophthalmic goiter with ocular muscle complications.** *Ophthalmology*, January, 1915.

EWING (30, **Abducens palsy following nasal trauma and infection**) found a paresis of the external rectus immediately after an injection of alcohol into the spheno-palatine ganglion. There was no affection of the vision and recovery took place twelve weeks afterward. The solution probably found its way upwards and outwards through the loose tissue to the sphenoidal fissure. The sixth nerve lies in the lower part of the fissure. Two other cases of spontaneous abducens palsy are reported in both of which the sphenoidal sinus was found affected.

ALLING.

WILLARD (36, **Exophthalmic goiter with ocular muscle complications**) found paralysis of the right superior rectus and

left inferior rectus, also paresis of the right external rectus, in one of his cases. The thyroid gland was operated upon and the patient recovered his health although there was still some weakness of the ocular muscles. Another patient complained of diplopia and showed paralysis of the right superior rectus and paresis of the right external rectus. After operation the exophthalmos greatly improved but the superior rectus did not regain its function. The exact site of the lesion in these cases which are not uncommon, is not known but is generally considered to be nuclear. It may be the effect of toxins produced by the perverted action of the thyroid.

ALLING.

HENRY'S (32, **Ophthalmoplegia interna caused by exposure to ultra-violet rays**) case is of a young man experimenting with ultra-violet rays immediately after which his right pupil became dilated and accommodation of that eye paralyzed. He recovered fully in a week under eserine. CURRAN.

According to the observations of GERTZ (31, **The gliding or slow movement of the eyes**) this slow movement of the eyes is not associated with fixation on an object passing by, but may be excited by the thought of, or the consciousness of, a moved object. It is the motor end-result of a certain effective state of the consciousness.

LUETTGE'S (33, **Anatomical condition in an associated lateral paralysis**) patient was a boy suffering from tuberculosis. The movements of the eyes up, down, and to the left were unrestricted, but as soon as they tried to turn to the right they were arrested at the middle line, so that the child sought to compensate for the trouble by turning his head to the right. Convergence was present, but it was impossible to induce an involuntary excursion of the eyes beyond the middle line by passive rotations of the head, sensory irritations, or anything else, so a nuclear paralysis was diagnosed. A trace of facial paresis on the right side may have been present. The boy died of diphtheria. On autopsy a solitary tubercle was found superficially in the cortex of the left occipital lobe, but outside of the visual tract. A number of sharply defined glial scars were found in the pons and midbrain, evidences of a former polioencephalitis. A focus measuring 6 by *2mm* lay at the level of the trigeminus immediately in front of the posterior

longitudinal bundle, yet without touching it, but a process extended to the right nucleus of the abducens which was almost completely destroyed.

DORFF (29, **Latent nystagmus**) describes two cases of the so-called latent nystagmus of Fromaget, in which the nystagmus is excited by the uncovering of one eye. Exclusion of light is not the cause, as the same effect is produced by the interposition of convex glasses. Refractive errors and disturbances of the muscular balance are almost always present, so therapeusis consists in correction of these errors, and an improvement of the binocular vision by stereoscopic exercises with as great an avoidance as possible of monocular fixation. The nystagmus is perceived subjectively by the patient.

In a series of cases published by REBER (35, **Influence of heredity in the development of strabismus**) ten years ago, he found that in 166 there was a hereditary predisposition in 33%. He now adds 81 private cases, 6% of which were divergent strabismus. In these 68% gave evidence of hereditary tendency. ALLING.

NICCOL (34, **A pedigree of hereditary nystagmus**), after reviewing Nettleship's work on nystagmus, presents an interesting family "tree" running into six generations showing the transmission of hereditary nystagmus. He has carefully studied 14 individuals and has collected information of 138 individuals of the family. Twenty of the family are affected with nystagmus, of whom 12 are males and 8 females. Twelve parents transmitted the condition to their children. Of these 4 are affected males and 8 females, of whom 5 were unaffected. Although the condition occurs in both sexes, Niccol sees a resemblance to sex-limited diseases. This paper should be read in the original. CURRAN.

IX.—LIDS.

37. FEHR. **A contribution to the adenomata of the lids.** *Zentralbl. f. prakt. Augenheilkunde*, January, 1915, p. 1.

38. KUHNT, H. **The obviation of epiphora due to eversion or commencing ectropion of the lower lid.** *Zeitschr. f. Augenh.*, 1915, p. 187.

FEHR (37, **Adenoma of the lid**) removed from the lower lid of a woman 65 years old an uncommon tumor that had gradually grown for nine years. The tumor was brown red, 3*cm*

long, 2*cm* broad, and 1*cm* high; its surface was rough, nodular, and moist; its consistence hard. It was attached to the margin of the lid by a long, narrow base like a polyp, without encroaching on the conjunctiva or the skin. The neighboring lymphatic glands were not swollen. Excision left no apparent defect in the lid margin. Microscopically it proved to be a typical adenoma, with cells that corresponded to those of the sebaceous and Meibomian glands. It differed from adenomata of the Meibomian glands in that it did not develop in the tarsus, but from a narrow base on the margin of the lid, so it must be taken for an adenoma of the sebaceous glands. There was no recurrence at the end of a year, although the operation was by no means radical.

In this paper, which is dealt with further in the next section, KUHNT (38, **Obviation of epiphora**) describes an operation for the obviation of a high degree of traumatic ectropion with a cicatricial coloboma of the lid adherent to the bone. An incision is made about the entire extent of the adherent cicatrix and this is excised carefully so as to free the leg of the coloboma thoroughly from the bone. Then the margin of the lid was shortened, as it had become too long from stretching, and any tendency to a gorelike notching of the margin of the lid had to be obviated by suitable incisions. A piece of fat of proper size was then taken from the thigh and transplanted so as to form a good support to the lid and conjunctiva, where it was fastened with catgut sutures. The soft parts of the lid and cheek were united by deep sutures. In cases of colobomata adherent to the bone without ectropion in the nasal third of the lid, one can occasionally leave the nasal leg in place, remove the margin of the lid with the roots of the cilia, draw over the mobilized temporal leg and suture it fast. He recommends this because the nearness of the lacrimal sac and the origin of the inferior oblique offer difficulties to an extensive dissection of the nasal portion of the lid.

X.—LACRIMAL ORGANS.

39. GIFFORD, H. **A method of destroying the lacrimal sac in chronic dacryocystitis.** *Ophthalmic Record*, January, 1915.

40. KUHNT, H. **The obviation of epiphora due to eversion or commencing ectropion of the lower lid.** *Zeitschr. f. Augenh.*, 1915, p. 187.

KUHNT (40, **Obviation of epiphora**) cuts a wedge-shaped piece from the conjunctiva and tarsus having the form of an isosceles triangle with its base at the margin of the lid. The chief fault with this procedure is that it causes a notch in the cartilage and a lump in the skin. To avoid this special instructions are given concerning the making of the incisions and the introduction of the sutures. When the shortening of the lid margin does not suffice, an operation for eversion is necessary, or an attempt to make the inner edge of the lid and the lacrimal punctum normal in position by the introduction of threads. The lower lid is everted to its maximum, the patient caused to look upward and outward, and an incision is made in the conjunctiva along the transitional fold from the inner canthus to near the middle of the lid, undermined to the lower border of the tarsus, fastened with two or three double-armed threads, and these are carried downward through the skin while the lid is lifted up strongly and tied. The original must be consulted for the details of both of these operations.

GIFFORD (39, **A method of destroying the lacrimal sac in chronic dacryocystitis**) for years has treated his cases of this disease with incision and actual cautery. He now uses liquefied trichloracetic acid. His method is as follows: The tissues are anæsthetized by infiltration with cocaine and adrenalin. The sac is incised and well exposed. After zinc ointment is applied to the surrounding skin the acid is thoroughly rubbed into every part of the interior of the sac. It is then syringed out and filled with aristol powder. He claims uniformly good results and no appreciable scar. ALLING.

XI.—ORBITS, INCLUDING EXOPHTHALMOS. ACCESSORY SINUSES.

41. HOROWITZ, P. **A case of osteoma of the frontal sinus.** *Diss.*, 1914, Leipsic.

42. IGERSHEIMER. **Inflammation of the orbit.** *Muenchener medizinische Wochenschrift*, 1915, p. 477.

43. IGERSHEIMER. **Temporal optic atrophy in ethmoiditis.** *Ibid.*, p. 477.

44. IGERSHEIMER. **Spindle-celled sarcoma of the upper lid.** *Ibid.*, p. 477.

45. KOEPPE. **A case of involvement of the optic nerve and unilateral exophthalmos in exophthalmic goiter.** *Ibid.*, p. 477.

46. KUHNT, H. **Mucocele of the frontal sinus and of the ethmoid with a sudden exophthalmos of high degree.** *Zeitschr. f. Augenh.*, 1915, p. 64.

In KOEPPE'S (45, **Involvement of the optic nerve and unilateral exophthalmos in exophthalmic goiter**) case the exophthalmos was unilateral at first, but later became bilateral. The temporal pallor of the papilla in the other eye spoke against a diagnosis of retrobulbar tumor. Both visual fields were normal, the Wassermann negative. The diagnosis of exophthalmic goiter was confirmed by both internists and neurologists. Later there appeared in the right field a paracentral, semicircular relative scotoma that showed an injury of the optic nerve. Such an injury may be produced by other causes, as in persons who have been treated with thyroidin for obesity.

IGERSHEIMER (42, **Inflammation of the orbit**) showed a case of injury of the orbit in a soldier who had been shot through the lower lid by a Russian bullet. The bullet together with a quantity of dirty gray fluid that enclosed it was easily removed by Kroenlein's operation.

IGERSHEIMER (44, **Spindle-celled sarcoma of the upper lid**) showed also a spindle-celled sarcoma of the upper lid of a five-years-old boy which developed in the temporal part of the orbit and pushed the globe inward and forward. Two distinct lobes in the region of the lacrimal gland simulated at first a tumor of this gland. It was removed by Kroenlein's operation.

In KUHNT'S (46, **Mucocele of the frontal sinus**) case a traumatic mucocele developed in the frontal sinus that gradually involved the anterior and middle ethmoid cells. The pressure wore away the margins of a fissure made by the injury, through which the mucous membrane protruded, where it finally ruptured and allowed a quantity of the contents of the mucocele to enter between the periosteum and the bone. This resulted in a sudden exophthalmos of high degree. The lids could not close, the cornea became infiltrated and broke down. The mucocele was then operated on.

HOROWITZ (41, **Osteoma of the frontal sinus**) in his dissertation reviews the literature on this subject extensively. He divides the syndrome into two kinds of symptoms, the ocular and the cerebral. The functional disturbance of the eyes is of the most importance, as in many cases it is the only pathological symptom to call attention to an osteoma of the frontal sinus, and is usually an early symptom. The visual disturbance is chiefly the consequence of the displacement of the eye-

ball. The ocular symptoms sometimes are exophthalmos, though this is rather rare in the early stage, sometimes in disturbances of the functions of the extrinsic muscles, usually causing diplopia. A ptosis is the first symptom in many cases. An optic neuritis is added very often, or rather a choked disk, caused by the increased intraorbital pressure. The cerebral symptoms, headache, vomiting, dizziness, weakness of memory, are less constant and characteristic. In the case reported by the writer he seems to think that these cerebral symptoms were particularly well marked, but otherwise the description hardly differs from the ordinary. The tumor was removed successfully.

The 59-years-old patient of IGERSHEIMER (43, **Temporal optic atrophy in ethmoiditis**) had noticed for several years a feeling of pressure in his right eye and for a year an impairment of his vision. The visual field was contracted greatly below, vision was $\frac{4}{15}$, the papilla had a temporal pallor. Polyps were found in the nose and in the posterior ethmoidal cells. Probably there was erosion of the bony wall and pressure upon the optic nerve. No central scotoma was present. Operation was followed by a quick improvement and the vision rose to $\frac{5}{8}$.

XII.—CONJUNCTIVA.

47. AXENFELD, TH. **Is there an immunity to trachoma?** *Klin. Monatsbl. f. Augenheilkunde*, February–March, 1915, p. 121.

48. ELSCHNIG. **Hemorrhage into the lymphatics of the bulbar conjunctiva.** *Zentralbl. f. prakt. Augenheilkunde*, January, 1915, p. 8.

49. DE HAAS, H. K. **Granuloma conjunctivæ caused by a foreign body.** *Nederl. Tijdschr. voor Geneesk*, 1914, ii., No. 16.

50. RANDOLPH, R. L. **Melanosis of the conjunctiva. Report of a case.** *Ophthalmic Record*, January, 1915.

51. SCHENDEROWITSCH, P., and SIEGRIST, A. **Treatment of gonorrheal ophthalmia of infants and adults at the University eye clinic at Berne.** *Therapeutische Monatschrift*, January, 1915, p. 35.

52. WOLFF, L. K. **A new remedy for the treatment of diplobacillus conjunctivitis.** *Nederl. Tijdschr. voor Geneesk*, 1914, ii., No. 7.

ELSCHNIG (48, **Hemorrhage into the lymphatics of the bulbar conjunctiva**) has seen several cases in which a subconjunctival hemorrhage was accompanied by one into the lymphatics. Over the immovable, smoothly red subconjunctival effusion the conjunctiva is slightly swollen, easily movable, and one

sees in it varicose blood-red tubes, about 1*mm* in diameter in front of the spot of blood. These little formations are seen particularly well with the corneal microscope. They coincide exactly in arrangement and extent with the lymphectasiæ of the bulbar conjunctiva, except that they contain fluid blood. They always disappear in three days at the most. A direct connection between them and the ecchymosis has not been observed.

WOLFF (52, **Treatment of diplobacillus conjunctivitis**) has treated successfully obstinate cases of diplobacillus conjunctivitis with a combination of fluorescin and zinc, which forms an orange powder that is thoroughly triturated and dusted into the conjunctival sac in small quantities. A concentrated solution in the tears is maintained for hours because of the slight solubility of the remedy, which shows the strong power of diffusion shown by all soluble combinations of fluorescin. This persistent action gives it an advantage over the solutions of zinc ordinarily employed. The tears are stained green for a day. VISSER.

The treatment of gonorrheal ophthalmia as described by SCHENDEROWITSCH and SIEGRIST (51, **Treatment of gonorrheal ophthalmia of infants and adults**) consists in cleansing the conjunctival sac with a two per cent. solution of boric acid and then instilling a three per cent. solution of collargol. This is done every hour at first, later only every two or three hours. Hot compresses of boric acid are applied for half an hour a half hour after each instillation. Syrgol has been used in the same way in a five per cent. solution. In 37 infants both eyes recovered without the least damage to the cornea. Treatment continued for from four to fifty-two days. In eight infants with corneal complications, three showed small maculæ on one eye, in three no corneal opacity was left, in one a little clear dimple was left in the cornea, and a leucoma adherens was caused in one. Of three adults with corneal complications, the eyes of one recovered without permanent harm, small leucomata adherentia were formed in both eyes of the second, and exenteration had to be performed in the third. Syrgol gave similar results. It is hard to say whether either remedy is any better than the other. The drawback of collargol is that it stains the exudate and the dressings black;

that of syrgol is that in infants it sometimes excites a diarrhea and a bad general condition.

AXENFELD (47, **Immunity to trachoma**) thinks that it is to be assumed that some men are less sensitive than others to trachoma, but this does not indicate the existence of an absolute immunity to the disease inasmuch as a special degree of virulence and a special way of transmission may always be imagined that could overcome the insusceptibility. The question in how far trachoma produces a local immunity must remain open for the present.

DE HAAS (49, **Granuloma conjunctivæ caused by a foreign body**) reports a case in which conjunctival granuloma grew rapidly after the removal of a benign cyst. A bit of the lint used for the dressing was found in the cells. The patient was myopic and the eye could not be closed completely on account of the protrusion. VISSER.

RANDOLPH (50, **Melanosis of the conjunctiva**) observed three small dark patches in the right lower conjunctival sac. The caruncle was deeply pigmented. In the left eye also there was a small pigmented area. No specimen could be obtained, but the condition was apparently congenital.

ALLING.

XIII.—CORNEA AND SCLERA.

53. AXENFELD, TH. **Keratitis punctata leprosa and hæmatogenous localization of the bacilli in the cornea.** *Klin. Monatsbl. f. Augenh.*, Feb.–March, p. 201.

54. FUCHS, E. **Nodular opacity of the cornea.** *Arch. f. Ophth.*, lxxxix., p. 337.

55. FUCHS, E. **Senile marginal atrophy of the cornea.** *Ibid.*, p. 386.

56. OHM, J. **The curative effect of scarlet red ointment in certain trachomatous ulcers of the cornea.** *Zeitschr. f. Augenh.*, 1915, p. 57.

57. REITSCH. **Staining of the superficially diseased cornea with fluorescin and Biebrich's scarlet red.** *Arch. f. Ophthalm.*, lxxxix., p. 299.

58. RUEMMLER, K. **Keratitis aspergillina.** *Diss.*, Leipsic, 1914.

59. SMYTH. **A case of extensive pigmentation of the sclera progressive (?).** *Transactions Ophthalmological Society of the United Kingdom*, 1914, p. 142.

60. VERHOEFF, F. H. **Scleral puncture for expulsive subchoroidal hemorrhage following sclerostomy. Scleral puncture for postoperative separation of the choroid.** *Ophthalmic Record*, February, 1915.

The staining of the superficially diseased cornea with fluorescin depends, according to Groenouw and Fromm and

the researches of REITSCH (57, **Staining of the cornea with fluorescin and scarlet red**), on diffusion into the corneal tissue, in the diseased epithelium and endothelium, and probably the stain affects only the cement substance and the lymph spaces in the propria. But one may be deceived easily as to the real size of the defect through the ready diffusibility. Where one obtains a stain with fluorescin the epithelial covering must be pierced, or there must be a certain loosening of the epithelium in superficial excoriations, and very minute superficial diseases of the eye may escape. In these cases scarlet red is better. Scarlet red is fitted for examination with artificial light and the corneal microscope. It is a direct tissue stain and does not diffuse. Excoriations by phlyctenular infiltrates are stained an intense red; superficial keratitides are as beautifully stained as herpes. This stain is particularly valuable in the most superficial diseases of the cornea, which one often suspects, but cannot see even with a great enlargement. The most minute punctate foci of disease or epithelial changes may be detected by its means. While it stains other ulcers well the author has seen no pneumococcus ulcer whose progressive margin had been stained even moderately well, so scarlet red may perhaps have some value in differential diagnosis. On the other hand quite fresh injuries do not take the red stain well until after the lapse of forty-eight hours; fresh erosions contain too small a number of nucleated cells. He has also used a double stain, first fluorescin, then scarlet red, which does particularly well in herpes corneæ. Scarlet red is not to be considered a sterile fluid, but the growth of bacteria may be checked by the addition of a very small quantity of a solution of oxycyanate of mercury.

OHM (56, **Curative effect of scarlet red in certain trachomatous ulcers**) has had good results in trachomatous ulcers of the cornea from an ointment containing scarlet red 0.5, olei olivæ q. s. for the most minute subdivision, vaselin ad 10.0, in connection with an atropine-cocaine ointment.

Five days before his admission to the clinic RUEMMLER'S (58, **Keratit s aspergillina**) patient, 49 years old, had his right eye injured by a straw. On admission there was a purulent corneal ulcer, the active agent of which was found to be the aspergillus. The ulcer was in the central lower part of the cornea, had a

yellowish gray base and thick margins. It was surrounded by a less marked ring of infiltration, with an interval between the two that was almost free from infiltration. The aqueous was cloudy and at the bottom of the anterior chamber lay a hypopyon *2mm* high. Perforation took place, followed by healing with an anterior synechia and agglutination of the margin of the pupil. Cultures and inoculations showed the agent to be the aspergillus fumigatus. There is no specific remedy for keratitis aspergillina known at the present time.

AXENFELD (53, **Keratitis punctata leprosa**) found an orange yellow, gelatinous thickening in the episclera about the cornea, in which there were numerous minute gray specks beneath the smooth epithelium that had no connection whatever with the margin. Corresponding to these, completely isolated in a non-vascular area, he saw microscopic nests of leprosy bacilli just beneath Bowman's membrane. This establishes the fact of isolated, hæmatogenous, metastatic foci of motionless bacilli in the cornea.

FUCHS (54, **Nodular opacity of the cornea**) describes the microscopical findings in two cases. There are two primary changes chiefly, namely the excretion of an often lamellated substance immediately beneath the epithelium that stains red with Giemsa's stain, and a granular substance in the cornea itself that stains blue. A characteristic point is that, aside from the larger gray nodules, the rest of the cornea was covered by dense, very minute, dustlike specks. He thinks it probable that the true nature of the disease in the granular excretion consists of a basophilic substance, and that the deposit of a second acidophilic substance upon Bowman's membrane occurs as something secondary. The changes of the epithelium, the thinning and destruction of Bowman's membrane, as well as the loosening up and destruction in places of the corneal lamellæ are always accessory. The disease appears to be a nutritive disturbance, or dystrophy, characterized by the excretion of substances that are insoluble in the tissue juices. He is inclined to ascribe it to an alteration of the internal secretions.

FUCHS (55, **Senile marginal atrophy of the cornea**) describes a microscopical preparation that showed changes which make it very probable that it presented the beginning of a senile

marginal atrophy of the cornea. The surface of the cornea was sunken at the arcus senilis. The change at the upper margin was more marked than at the lower. The tissue was unravelled with a steep, sharp central, and a sloping, indistinct peripheral margin. The change begins with the splitting of Bowman's membrane, at or near its margin. Then the corneal lamellæ lying immediately beneath change so that the deeper-lying cement joining the fibrils dissolves. Another change takes place in the breaking down of the corneal substance. The dissolution of the cement between the fibrils and the loosening of some of them must be regarded as the result of an altered chemical condition and as a process of degeneration, as signs of inflammation were absent. The nuclei of the fixed corneal corpuscles were increased. The change increases continually in depth, but not in breadth; the lamellæ formed by splitting become thin and have an appearance more like connective tissue, some lamellæ at the central margin of the groove are entirely destroyed; finally the base of the groove becomes ectatic, Descemet's membrane protrudes and ruptures or is covered by a deposit.

SMYTH (59, **Extensive pigmentation of the sclera**) reports a case of twelve years' progression in one eye, the lower and inner quadrant being most affected, the upper quadrant being free from change.

CURRAN.

VERHOEFF (60, **Scleral puncture for hemorrhage after sclerostomy**) performed a sclerostomy combined with a large buttonhole iridectomy in an eye with glaucoma simplex in which the tension was *72mm.* No difficulties were encountered until the end of the operation when the vitreous appeared and continued to pour out rapidly. About one half of the vitreous was extruded before the flow suddenly ceased. Four hours later he made three scleral punctures which allowed the escape of considerable blood but the eye immediately filled again. There was some pain and some hemorrhage during the day following but the eye recovered with normal tension and vision $\frac{20}{40}$. He suggests the possibility of help from this procedure in expulsive hemorrhage after operation. Verhoeff also reports a case of supposed choroidal separation, three weeks after cataract operation, in which he did scleral puncture

and obtained a considerable quantity of clear fluid. The eye, which had been soft, inflamed, and, with no anterior chamber, returned to normal. ALLING.

XIV.—IRIS AND PUPILS.

61. HILBERT. **A case of hippus.** *Zentralbl. f. prakt. Augenh.*, Feb., p. 38.

62. METZNER and WOELFFLIN. **Clinical and experimental studies of paralysis of the cervical sympathetic.** *Arch. f. Ophth.*, lxxxix., 2, p. 308.

63. REBER, W., and LAWRENCE, G. **Gonorrheal iritis as a manifestation of an old latent gonococcæmia.** *Ophthalmic Record*, January, 1915.

64. STEINER. **Iris with congenital melanosis.** *Klin. Monatsbl. f. Augenheilkunde*, February–March, 1915, p. 193.

METZNER and WOELFFLIN (62, **Paralysis of the cervical sympathetic**) have studied this subject clinically and experimentally. Woelfflin deals with the clinical part. He divides the symptoms into three groups, the oculo-pupillary, the vascular, and the trophic. Only three of the ocular disturbances were formerly known, the so-called Horner's triad, myosis, narrowed palpebral fissure, and enophthalmos. The pupillary difference is less in adaptation to light than to dark, a point that may be of diagnostic importance. While the size of the pupil remains almost constant the width of the palpebral fissure may undergo fluctuations of several millimeters. Enophthalmos is less common. Hypotony is to be observed in paralysis of the sympathetic, as was proved experimentally, but it is transient. Sometimes lacrimation occurs, the reason of which is not quite clear; perhaps the lacrimal gland has a double innervation from the sympathetic and facial. The vessels of the eye are dilated the same as those of other regions affected. A flattening of the cornea occurs, which may amount according to some writers to 1¼ to 1½ D, although Hertel could demonstrate nothing of the sort. The discoloration of the iris is plainly a sign of trophic disturbances, which show themselves mainly in emaciation of the side of the face, but may extend to troubles in the bones. The vascular disturbances express themselves, often transiently, in marked dilatations of the vessels on the affected side, which undergo fluctuations. Perspiration is sometimes increased, sometimes diminished, usually the latter.

HILBERT (61, **Hippus**) observed a case of iridocyclitis of one

eye and a hippus of the other without other disturbances. After the iridocyclitis got well the hippus disappeared.

STEINER (64, **Iris with congenital melanosis**) observed in a Japanese woman a melanosis of the iris, which is very rare in that race. The entire surface of the iris formed a uniform plane disfigured by flat, wartlike elevations. No traces of the usual details of the iris could be seen. The color was a dark black brown. There were no signs of a former inflammation.

REBER and LAWRENCE (63, **Gonorrheal iritis as a manifestation of an old latent gonococcæmia**) report three cases in which the gonorrheal infection was latent, and in one case was of fifteen years' standing. The complement-fixation test was positive. In all there was rapid improvement and almost immediate cessation of pain after injection of stock Neisser serobacterin (mixed). Iritis is probably caused by latent gonococcæmia more often than is supposed, and the complement-fixation test, as well as the Wassermann, should be made in all cases.

ALLING.

XV.—LENS.

65. AXENFELD. **Blepharotomia externa during cataract extraction.** *Klin. Monatsbl. f. Augenheilkunde*, January, 1915, p. 97.

66. CLARK, C. F. **Congenital cataract.** *Ophthalmic Record*, March, 1915.

67. CRIDLAND. **A case of glassblower's cataract in a "puddler" (ironworker).** *Ophthalmoscope*, March, 1915.

68. ELSCHNIG. **Intraocular reposition.** *Klin. Monatsbl. f. Augenheilkunde*, February–March, 1915, p. 186.

69. FERGUS, FREELAND. **Essential points in cataract operations.** *Ophthalmic Review*, September, 1914.

70. LANCASTER and WILLIAMS. **The effect of accommodation on the viscosity of the lens.** *Ophthalmoscope*, March, 1915.

71. SAUPE. **The results of operations on juvenile cataract.** *Inaug. Diss.*, Jena.

72. ZIMMERMAN, C. **Annular opacity of the anterior surface of the lens after traumatism.** *Ophthalmology*, January, 1915.

LANCASTER and WILLIAMS (70, **The effect of accommodation on the viscosity of the lens**) give an account of some interesting experiments which go to prove that viscosity of the lens is a considerable factor in the process of accommodation. In such an excellent paper as this, it is to be regretted that the authors

do not state the ages of the subjects experimented on. A series of such experiments on persons of different ages would be of great value.

CURRAN.

ZIMMERMAN (72, **Annular opacity of the anterior surface of the lens after traumatism**) noted the typical Vossius ring of faint opacity on the anterior surface of the lens, about the size of the medium-dilated pupil, after an injury to the eye by a rifle loaded with dirt. It disappeared in about three weeks. It was not visible by oblique illumination but with a strong convex lens in the ophthalmoscope. He does not think that the condition is produced by indentation of the cornea but by increased pressure in the anterior chamber forcing the iris against the lens.

ALLING.

CRIDLAND (67, **A case of glassblower's cataract in a "puddler"—iron worker**) reports a case of cataract in a worker in iron which had the posterior polar opacities similar to the glassblower's cataract. He had seen five similar cases in ten years, and since the cataract can be found in other occupations than glassblowers' who have to gaze at bright hot lights, he suggests the term "ray cataract."

CURRAN.

FREELAND FERGUS (69, **Essential points in cataract operations**) says if an operation is absolutely aseptic, there will not be any iritis. He does not think that the inclusion of the capsule or lens substance or shreds of iris cause postoperative inflammation; nor does he consider articles of lens substance in the eyeball conducive to inflammation. He holds that all such postoperative inflammations are due to infection, and that if the eye is kept absolutely aseptic there is no chance of a tough capsule and if there is any secondary cataract it will be of the flimsiest kind.

CURRAN.

CLARK (66, **Congenital cataract**) is a strong advocate of free discission of cataract, in young people, followed at the right time, usually a few days, by linear extraction. As one can always remove the swollen lens matter if glaucoma ensues, it is difficult to see why it is not safer to allow it to absorb by the usual method.

ALLING.

SAUPE (71, **Results of operations on juvenile cataracts**) gives the results of twenty-seven operations on nineteen patients. General anæsthesia was used with the smaller children. He prefers primary linear extraction as only one operation is needed as a rule and the secondary cataract is slight. Iridectomy is avoided when possible. The results of primary linear extraction are better than after a preliminary discission, as this sometimes misses its aim and necessitates a longer treatment.

AXENFELD (65, **Blepharotomia externa during cataract extraction**) makes a simple canthotomy when the palpebral fissure is too small, especially when the lids are tense, and sometimes when the patient squeezes. An anæsthetic is injected and a snip is made with scissors at the outer canthus without causing pain or bleeding. The wound heals readily with no sutures. (This operation has never been thought worthy of the dignity of being so designated in this country, but has been performed whenever indicated for a great many years.—F.)

It occasionally happens after a linear extraction of cataract that a bit of the iris becomes engaged in the incision, causing a distortion of the pupil and a lowering of the vision. To obviate this ELSCHNIG (68, **Intraocular reposition**) introduces a Knapp's knife needle into the anterior chamber at the margin of the cornea and disengages the iris from the cornea with its point. The pupil then becomes round. It may be possible to detach the iris at its root if its tissue is rigid.

(*To be continued.*)

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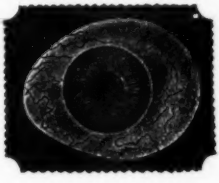

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